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ABSTRACT

This curriculum guide contains operational guidelines to help local administrators, teacher educators, and industrial arts teachers in the State of Louisiana determine the extent to which their technical drafting courses are meeting the needs of the youth they serve. It consists of a discussion of course prerequisites, goals, content, and implementation as well as 14 units devoted to various subject areas addressed in technical drafting courses. Covered in the individual units are rules and regulations, sketching, drafting room safety, lettering techniques, care and use of equipment, geometric construction, orthographic projection, dimensioning/size description, pictorial drawings, sectional drawings, auxiliary drawings, thread representations, and working drawings. Each unit contains objectives, time allotments, suggested topics, student activities, teacher activities, and resources. Among those items appended to the guide are information sheets, explanations of various drafting procedures, a course evaluation sheet, suggested projects, a sample lesson plan, sample tests, suggested student expectations, a list of tools and equipment, and resources.(MN)

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STATE OF LOUISIANA

DEPARTMENT OF EDUCATION

BULLETIN NO. 1686

INDUSTRIAL ARTS CURRICULUM GUIDE

IN

BASIC TECHNICAL DRAFTING

Issued by

Office of Vocational Education

N. J. Stafford, Jr., Ed.D.
Assistant Superintendent

J. KELLY NIX
State Superintendent

CE 034 375

U.S. DEPARTMENT OF EDUCATION
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PREFACE

This course is designed to have students learn about various fields of industry and manufacturing such as woodworking, construction, metalworking, plastics, graphic arts, crafts, power, electricity and other subjects taught in industrial arts programs. It is hoped that the instructor will have students design and make "mini" projects related to as many specific subject areas as possible. Students should be encouraged to experiment and do further study to enhance their understandings of materials, processes, and products of industry.

Each student should be taught basic sketching and drawing skills to become familiar with the language of industry. Students should become knowledgeable of the functions of industry with respect to planning, production, quality control, marketing and career opportunities offered in the world of work. By teaching basic concepts in the many fields, instructors can relate and show similarities and relationships to emphasize commonalities in industry and manufacturing in America.

As the first course offering in the secondary school curriculum, this course can be used effectively by any age group, including both male and female students. By making instruction interesting, instructors will attract students into other specialized Industrial Arts courses or continue their education in specific vocational courses at the Comprehensive High School, Career Campus or Vocational-Technical School.

Foreword

This publication is a guide for the improvement of instruction in Industrual Arts Education for the State of Louisiana. It should be of benefit to industrial arts teachers, supervisors, counselors, and administrators. These operational guidelines will help local administrators, teacher educators, and industrial arts teachers to determine the extent to which their programs are meeting the needs of our youth. Industrial Arts Education Programs must be organized to meet the needs of all students.

A constant concern for educators is the construction and revision of curriculum. Industry and technology are the core of industrial arts instruction. Both are constantly changing; therefore, curriculum and instruction must change in order to provide students a realistic and accurate understanding of industry and its function in our complex technological society.

J. KELLY NIX
State Superintendent of Education

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This publication represents the cooperative efforts of personnel in the Louisiana Industrial Arts Association and the Industrial Arts Section in the Office of Vocational Education, Louisiana State Department of Education. Special recognition goes to Dr. Thomas Eppler, Northwestern State University, Regional Co-Director; Dr. Vincent F. Kuetemeyer, Louisiana State University, Regional Co-Director; Mr. Thomas Landry, University of Southwestern Louisiana, Regional Co-Director; and Dr. James W. Trott, Louisiana State University, Project Coordinator-Director who served as Project Director in the development of the guide. Special commendation goes also to members of the writing team who worked diligently to make this publication a reality.

The following teachers spent many hours writing, field testing, and finalizing these guidelines. They are: Vincent D. Tuminello, Charles Powell, and John Aubespin.

N. J. Stafford

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Assistant Superintendent
Office of Vocational Education

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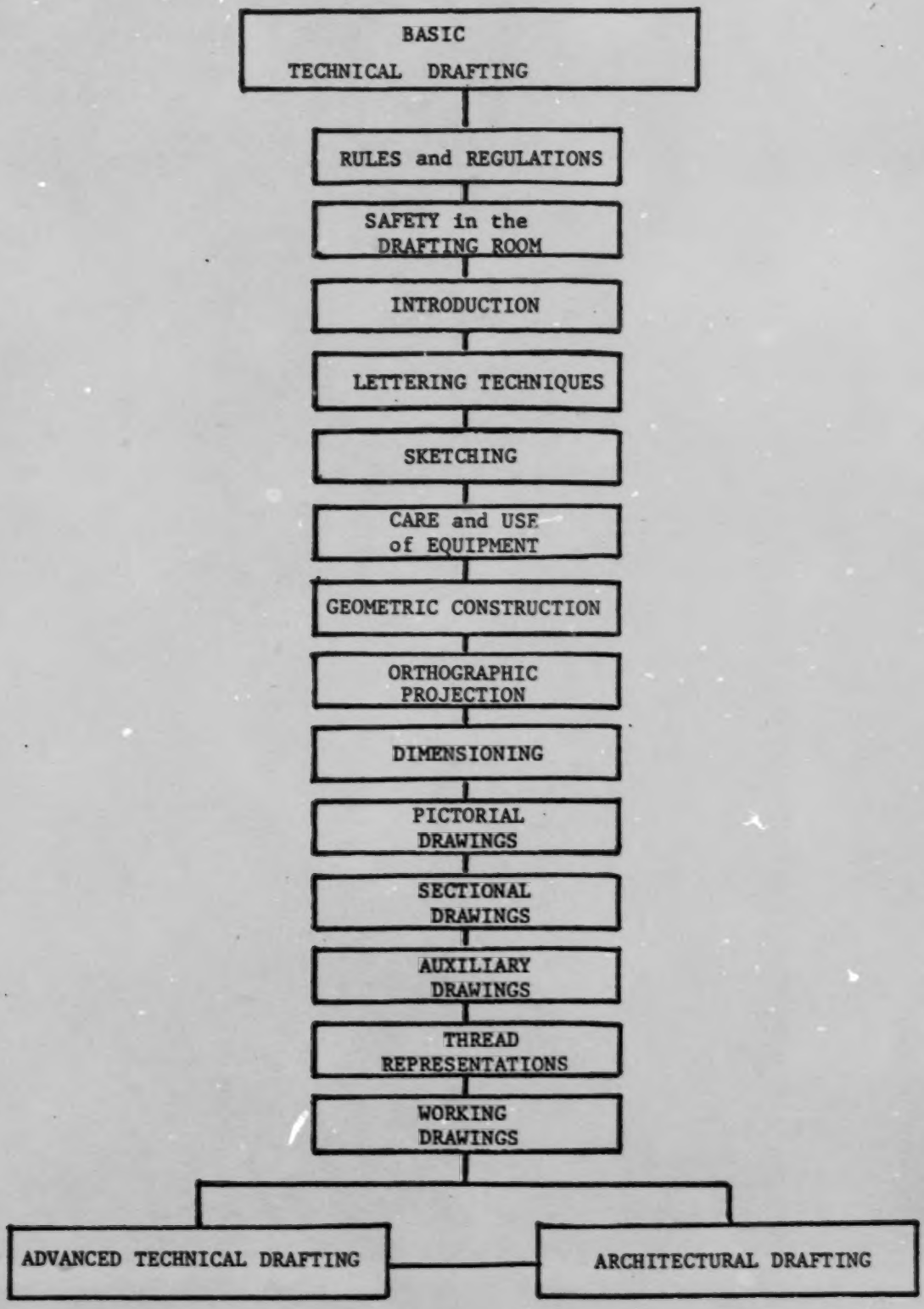
Lettering; Border Lines and Title Strip, Centering Multiview Drawings; Centering an Isometric Drawing; Course Evaluation; Grading Chart; Suggested Projects; Sample Lesson Plan; Scale Exercise Sample Tests; Rules and Regulations; Suggested Student Expectations; Measuring Achievement; Tools and Equipment; Resources


BASIC
TECHNICAL DRAFTING
RULES and REGULATIONS
SAFETY in the DRAFTING ROOM
INTRODUCTION
LETTERING TECHNIQUES
SKETCHING
CARE and USE of EQUIPMENT
GEOMETRIC CONSTRUCTION
ORTHOGRAPHIC PROJECTION
DIMENSIONING
PICTORIAL DRAWINGS
SECTIONAL DRAWINGS
AUXILIARY DRAWINGS
THREAD REPRESENTATIONS
WORKING DRAWINGS
ADVANCED TECHNICAL DRAFTING
ARCHITECTURAL DRAFTING

Title:

Basic Technical Drafting

Course Description:

Basic Technical Drafting is designed to give the student a general overview of the basic concepts that are common to the broad field of technical drawing. Drafting is used by engineers, designers, architects, and other individuals to describe the size, shape, and other details of manufacturing that cannot be effectively described with the written words of a language. However, one need not be engaged in one of these vocations to benefit from experiences in the drafting field. The ability to read and understand drawings that are concerned with the assembly, installation, and operation of common household products is becoming increasingly important as these items become more complex. For this reason drafting should be one of the first areas to be offered in the industrial arts program and should be open to males and females.

Target Grade Levels:

Grades 9 - 12.

Prerequisite:

None

General Program Goals and Objectives:

In Basic Technical Drafting, students will become acquainted with occupational opportunities in this field of work, and should develop an appreciation for drafting as a universal means of communication. Experiences will be provided to develop in each student the ability to read drawings and to visualize relationships between objects and working drawings. The study cannot be in depth, but it must be thorough enough to develop the ability to express ideas graphically and to solve everyday problems through the use of drawing.

Specific Objectives:

1. To develop skills in the proper use of drafing tools and materials.
2. To develop an understanding of the technical aspects of drafting.
3. To develop an appreciation for the value and worth of good designing.
4. To foster an understanding of the importance of drafting in industry.
5. To develop worthy leisure-time interests.

INTRODUCTION TO BASIC TECHNICAL DRAFTING

Basic Technical Drafting is a course in general drafting designed to give students a broad overview of drafting fields. The content is such that it has value for those who plan to work in any phase of industry, including positions in engineering, management, education, skilled or semi-skilled occupations, office work, sales and promotion, service and repair, and many other fields. Each student is given the opportunity to develop the ability to express his ideas in pictorial form, to describe the shape of objects through the use of drawings, and to read and to understand projection methods and blue prints. Technical accuracy is necessary, and related mathematics, science, and technical vocabulary are taught simultaneously with practical activities.

This curriculum guide and outline will serve as a guide for teaching Basic Technical Drafting. The implementation of the objectives and activities presented in this guide is recommended for continuous systematic and sequential development of the basic technical drafting student.

This curriculum guide will cover two semesters of work for one unit of credit. This course is open to ninth, tenth, eleventh and twelfth grade students. The class should meet one hour per day, five days per week for thirty-six weeks (180 days).

BASIC TECHNICAL DRAFTING

A YEARLY OUTLINE

I. STATE, PARISH, LOCAL SCHOOL, AND CLASSROOM LEGAL RULES AND REGULATIONS

II. SAFETY IN THE DRAFTING ROOM

- A. Student Responsibilities
- B. Safe Use of Equipment
- C. Safe Use of Individual Drafting Equipment
- D. Room Arrangement Safety
- E. Housekeeping Safety
- F. Personal Safety

III. INTRODUCTION

- A. History of Drafting
  1. Earliest forms of communications
     a. Drawings on cave walls
     b. Drawings on clay tablets, parchment, or papyrus, wood and slabs of limestone
  2. Evolution of modern drafting
     a. DaVinci, Leonardo
     b. Monge, Gaspard (1746-1818)
     c. Crozet, Claude - (1816)
     d. West Point
     e. Today's drafting
- B. Types of Drawings
  1. Artistic
     a. Aesthetic ideas
     b. Philosophic expressions
  2. Technical
     a. Exact representation
     b. Standardized
     c. Accuracy

C. Careers in Drafting

1. Opportunities
   a. Aeronautical
   b. Electrical and electronics
   c. Mechanical
   d. Sheet metal
   e. Architectural
   f. Map
   g. Structural
   h. Pipe
2. Types of training
   a. High school followed by apprenticeship
   b. Technical/Trade School--Technician
   c. College/University--Engineering
3. Qualifications
   a. Accuracy
   b. Neatness
   c. Aptitude

IV. LETTERING TECHNIQUES

A. Types of Lettering

1. Single stroke commercial gothic
   a. Vertical
   b. Inclined
2. Architectural

B. Guidelines

1. Horizontal
2. Vertical
3. Inclined

C. Lettering Instruments

1. Ames Lettering Guide
2. Braddock-Rowe Triangle
3. Professional Lettering Instruments
   a. Leroy Lettering Set
   b. Koh-I-Nor Set
   c. Wrico Set
4. Plastic lettering templates

V. SKETCHING

A. Purpose

1. To communicate ideas
2. To determine time element
3. To record ideas
4. To simplify a technical discussion

B. Aids in Sketching

1. Paper and cardboard guides
   a. Straight
   b. Folded
2. String compass

C. Lines, Straight

1. Horizontal
2. Vertical
3. Inclined

D. Lines, Curved

1. Circle
2. Arcs

VI. CARE AND USE OF EQUIPMENT

A. Drawing Desk

B. Drawing Boards

1. Type of boards
   a. Bass wood
   b. Soft pines
   c. Metal edge
2. Size of board
   a. 18" x 24"
   b. 24" x 36"

C. T-Square

1. Types of T-squares
   a. Plastic
   b. Metal
   c. Wood

2. Sizes of T-squares
   a. 24"
   b. 36"
3. Parallel bar
4. Drafting machine
5. Aligning paper
6. Drawing horizontal lines

D. Drawing Paper/Film/Cloth

1. Kinds of paper
   a. White
   b. Tinted
   c. Tracing
   d. Vellum
   e. Polyester
2. Drawing paper sizes
   a. First series
      (1) 8½" x 11"
      (2) 11" x 17"
      (3) 17" x 22"
      (4) 22" x 34"
      (5) 34" x 44"
   b. Second series
      (1) 9" x 12"
      (2) 12" x 18"
      (3) 18" x 24"
      (4) 24" x 36"
      (5) 36" x 48"
3. Mounting the paper
   a. Tape
   b. Tacks

E. Pencil

1. Types of pencils
   a. Pentel
   b. Lead-holder
   c. Wood pencil
2. Leads
   a. Degrees of hardness
   b. Sharpening
3. Drawing lines
4. Lettering

F. Triangles

1. Types of triangles
   a. 30^{o} x 60^{o} - clear
   b. 45^{o} - clear
2. Sizes
   a. 8"
   b. 10"
   c. 12"
3. Vertical lines
4. Inclined lines
5. Parallel
6. Perpendicular

G. Erasers

1. Types of erasers
   a. Art gum
   b. Plastic
2. Erasing shields
   a. Metal
   b. Plastic

H. Irregular Curves

1. Types of curves
   a. French curve
   b. Adjustable--flexible
   c. Ship curve
2. Connecting plotted points

I. Case Instruments

1. Minimum requirement
   a. Compass
      (1) Types of compasses
         (a) Large bow
         (b) Small bow
         (c) Drop bow
         (d) Friction
         (e) Beam
      (2) Sharpening compass lead
         (a) Chisel point
         (b) Conical point
   b. Divider
      (1) Types of Dividers
         (a) Friction
         (b) Proportional
      (2) Transferring distances
      (3) Dividing lines and arcs into equal segments
2. Advanced equipment optional

J. Scales

1. Types of scales
   a. Architect
   b. Engineer
   c. Metric
   d. Combination
2. Materials of scales
   a. Wood
   b. Plastic
   c. Metal
3. Shapes of scales
   a. Triangular
   b. Flat
   c. One bevel
   d. Two bevel
   e. Four bevel

K. Drawing Techniques

1. Keeping drawings clean
   a. Dusting powder
   b. Fix-it spray
2. Drawing straight lines
   a. Horizontal
   b. Vertical
   c. Inclined
   d. Parallel
   e. Perpendicular
   f. Angles
   g. Pencil rotation
3. Drawing curve lines
   a. Arcs
   b. Circles
   c. Irregular curves
4. Border line and title strip
5. Problem centering

VII. GEOMETRIC CONSTRUCTION

A. Importance of Geometry

1. A study of size and shape
2. Solving drawing problems

B. Application of Geometry

1. Bisecting lines and angles and arcs
2. Dividing lines, angles and arcs into equal parts
3. Erecting perpendicular
4. Parallel lines
5. Construction of geometric figures
   a. Square
   b. Hexagon
   c. Octagon
   d. Pentagon
6. Tangent lines and circles

VIII. ORTHOGRAPHIC PROJECTION/MULTIVIEW DRAWING/SHAPE DESCRIPTION

A. Projection Box/Six Possible Views

1. Front view
2. Top view
3. Right side view
4. Left side view
5. Rear
6. Bottom

B. Drawing of An Object Using Third Angle Projection

1. Frontal
2. Horizontal
3. Profile

C. Choice of Views

1. Most descriptive view
2. Number of views necessary

D. Location of View

E. Mathematical Layout of Views

1. Centering within working area
2. Spacing between views

F. Alphabet of Lines

1. Construction lines
2. Border lines

3. Object lines
4. Hidden lines
5. Center lines
6. Guide lines

IX. DIMENSIONING-SIZE DESCRIPTION

A. Importance of Dimensions

1. To be accurate in size description
2. To complete description of object

B. Alphabet of Lines

1. Extension lines
2. Dimension lines
3. Center lines
4. Leaders

C. Termination of Dimension Lines

1. Arrowheads
2. Dot
3. Diagonal line

D. Direction of Dimension Figures

1. Unidirectional system
2. Aligned system

E. Dimensioning Angles

1. Linear dimensioning
2. Coordinate dimensioning

F. Dimensioning Arcs and Circles

G. Finish Symbols

1. Finish marks
2. Surface roughness

H. Geometric Breakdown

1. Size dimension
2. Location Dimension

I. Notes

1. Local
2. General

J. Dimension Figures

1. Whole numbers
   a. Feet
   b. Inches
2. Fractions

K. Abbreviations

1. Diameter
2. Radius
3. Required
4. Chamber
5. Countersink
6. Counterbore
7. Degree
8. Material
9. Reference
10. Spot face
11. Stock
12. Thread
13. Center line
14. Millimeter

L. Methods of Dimensioning

1. Consecutive
2. Progressive

M. Limit Dimensioning

N. Tolerance

1. Unilateral
2. Bilateral

O. Decimal System

P. Metric System

X. PICTORIAL DRAWING

A. Use of Pictorial Drawings

1. Supplement to working drawings
2. Enables layman to visualize the design represented

B. Types of Pictorial Drawings

1. Oblique
   a. Cabinet
   b. Cavalier
2. Isometric
3. Perspectives
   a. One point
   b. Two point

C. Oblique Axes

1. Variation of direction
2. Variation of angle

D. Isometric Axis

1. Variation of direction
2. Angle of axes

E. Lines in An Isometric Drawing

1. Isometric
2. Non-isometric

F. Angles in Pictorial Drawings

G. Arcs and Circles in Pictorial Drawings

1. Rhombus
2. Four center approximate ellipse

H. One Point Perspective Drawing

1. Front view projection
   a. Horizon line
   b. Vanishing point
   c. Group line
2. Station point projection
   a. Horizon line
   b. Ground line
   c. Vanishing point
   d. Top view
   e. Picture plan line

I. Two Point Perspective

1. Ground line
2. Picture plane line

3. Horizon
4. Station point
5. Two vanishing points
6. Line of sight-true length line
7. Top view
8. Elevation view

XI. SECTIONAL DRAWINGS

A. Purpose of Section Drawings

1. Show interior details of an object
2. Show the complex operation of an object

B. Cutting Plane Line

1. Show edge of cutting plane
2. Location of cutting plane line
3. Equal dash cutting plane line
4. Alternate dash cutting plane line

C. Section Lining Symbols

1. General purpose symbol
   a. 45° angle section lining
   b. 1/8" section line spacing
   c. Opposite angle section lining
2. Other symbols-see reference material

D. Types of Sections

1. Full section
2. Half section
3. Offset section
4. Broken out section
5. Remove section

E. Conventional Break

1. S-break
   a. Pipe
   b. Solid
2. Rectangular break

XII. AUXILIARY DRAWINGS

A. Purpose of An Auxiliary

1. Describes true size and shape of an inclined surface

2. Describes special features of an object not perpendicular to the normal plane of projection

B. Kinds of Auxiliary Views

1. Primary auxiliary
2. Secondary auxiliary

C. Methods of Construction

1. Folding plane
2. Center line
3. Reference line

D. Steps of Constructions

E. Plotting Curves

XIII. THREAD REPRESENTATION

A. History and Functions of the Threaded Fasteners

1. Archimedes
2. Leonardo da Vinci
3. Whitworth
4. William Sellers

B. Standardization

1. American standard screw thread
2. Unified screw thread
3. ANSI metric fasteners standard

C. Application of Screw Threads

1. Hold parts together
2. Adjust parts
3. Transmit power

D. Thread Terminology

1. Thread nomenclature
2. Thread notes

E. Types of Thread Fasteners

1. Bolts
   a. Hex head
   b. Square
2. Screws

F. Schematic Representation

1. Internal
2. External

G. Simplified Representation

1. Internal
2. External

XIV. WORKING DRAWINGS

A. Application of Working Drawings

1. To show size, shape and specifications of an object
2. To show how an object is serviced or put together

B. Methods of Layout for Working Drawings

1. Detail drawing
2. Assembly drawing

C. Specifications

1. Materials and parts lists
2. Notes

BASIC TECHNICAL DRAFTING

SUGGESTED TIME ALLOTMENT

The suggested time frame for Basic Technical Drafting is 166 days. The remaining 14 days are to be used as necessary for the opening and closing of the Drafting Laboratory, school functions, and in units where the instructor feels additional time is needed.

If time dictates that this course must be taught in one semester, rather than a full 180 day school year, Units I through X (Rules and Regulations -- Pictorial Drawings), should be covered.

UNIT I RULES AND REGULATIONS - 2 Hours

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to:	State Rules		Discuss the various rules and regulations that apply to your particular situation.	State Handbook Parish Handbook
Identify the State, Parish, School, and room rules and regulations that apply to the drafting room.	Parish Rules School Rules Classroom Rules	Read and sign rules and regulations hand-out sheet.	Make hand-out sheet for students to read and sign, including the rules and regulations. Could be made in duplicate so both teacher and student can keep a copy.	School Handbook

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UNIT II SAFETY IN THE DRAFTING ROOM 1 Hour

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Identify the safety rules and regulations that apply to the drafting room.	Student Responsibilities Safe use of individual drafting equipment. Room arrangement safety Housekeeping safety Personal Safety	Read and sign safety hand-out sheet. Safety test	Demonstrate the correct way to use classroom equipment, such as the paper cutter. Make bulletin boards using a comic strip type of character showing hazards that apply to a drafting class. Demonstrate the safe use of student equipment.	Unit 1, Lesson 3 pp. 1-3

UNIT III INTRODUCTION 1 Hour

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Outline a brief history of drafting; Identify the major types of technical drawings; Identify the various careers available in the drafting occupations.	A. History of Drafting 1. Earliest Forms of Communications a. drawings on cave walls b. drawings on clay tablets, parchment, papyrus, wood, and slabs of limestone 2. Evolution of Modern Drafting a. DaVinci, Leonardo b. Monge, Gaspard c. Crozet, Claude d. West Point e. Today's Drafting	Read Chapter. Answer study questions. Write a short paper on "The Evolution of Modern Drafting."	Exhibit collection of artistic and technical drawings throughout the classroom. Gather and disseminate information about different drafting careers.	(1) pp. 1-6 (2) pp. 1-14 (3) Unit 1, Lesson 1 (4) pp. 1-9
	B. Types of Drawings 1. Artistic a. aesthetic ideas b. philosophic expression 2. Technical a. exact representation b. standardized c. accuracy		Have an advanced drafting student speak to the class on what he/she learned from his/her basic drafting course and why he/she is taking advanced drawing.	(1) p. 2
	C. Careers in Drafting 1. Opportunities a. aeronautical b. electrical/electronic c. mechanical d. sheet metal e. architectural f. map g. structural h. pipe	Visit school guidance counselor. Begin a collection of newspaper want ads for career opportunities.		(1) p. 3 (2) p. 7 (3) Unit 1, Lesson 2 (4) pp. 2,3,& 5 (5) p. 6
	2. Types of Training a. high school-apprenticeship b. trade school-technician c. college/university-engineer		Construct flow chart depicting avenues of study and their job outcomes.	
	3. Qualifications a. accuracy b. neatness c. aptitude	Complete student lab projects and assignments. Unit Test	Display drawings that will show <u>acceptable</u> and <u>unacceptable</u> quality.	

UNIT IV LETTERING TECHNIQUES 10 Hours

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Construct vertical or inclined, single-stroke commercial gothic lettering, numerals and fractions, including proper spacing and guidelines; Identify and select the proper lettering instruments; Letter notes, titles, and other information required on drawing.	A. Types of Lettering 1. single-stroke commercial gothic 2. architectural B. Guidelines 1. horizontal 2. vertical 3. inclined C. Lettering Instruments 1. Ames Lettering Guide 2. Braddock-Rowe Triangle 3. Professional Lettering Instruments (a) Leroy Lettering Set (b) Koh-I-Nor Set (c) Wrico set 4. Plastic lettering templates	Read Chapter; answer study questions; complete hand-out sheets. Use single-stroke commercial gothic, vertical and inclined lettering numerals, and fractions on lettering sheets. Draw horizontal, vertical, and inclined guidelines. Draw guidelines using lettering instruments. Complete student lab projects and assignments. Unit Test..	Demonstrate, and have each student learn the correct strokes for each letter of the alphabet and numerals. Demonstrate the correct method for drawing guidelines using the Ames Lettering Guide. Show and explain the different type of professional lettering instruments; such as the Leroy Set.	(1) p. 53 (2) p. 530, 531 (3) Unit 3, Le. 1 (4) pp. 55-59 (5) p. 450, App. 1, 2, 3, 4, 5, 6, 7 (1) p. 54 (2) p. 531 (4) p. 57 (5) p. 47 (1) pp. 55-61 (2) p. 43 (3) Un. 3, Le. 5 (4) pp. 57-58 (5) p. 48

UNIT V SKETCHING 5 Hours

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Diagram how sketching aids creative communication; Identify and apply various types of sketching aids; Sketch simple objects using correct line techniques.	A. Purpose 1. to communicate ideas 2. to save time 3. to record ideas 4. to simplify a technical discussion	Read Chapter. Answer study questions.	Show examples of professionally prepared technical sketches	(1) pp. 7-17 (2) pp. 15-37 (4) pp. 28-35 (5) pp. 25-30
	B. Aids in Sketching 1. paper and cardboard guides a. straight b. folded 2. string compass	Sketch straight lines. Sketch arcs, circles, and other curves.	Demonstrate the correct procedure for sketching various lines.	(1) pp. 10, 12, 13 (2) pp. 20-21 (4) pp. 30-32 (5) p. 27
	C. Lines--Straight 1. horizontal 2. vertical 3. inclined			
	D. Lines--Curved 1. arcs 2. circles	Sketch assigned problems using learned sketching techniques. Complete student lab projects and assignments. Unit Test	Demonstrate the construction and use of sketching aids, such as a string compass.	(1) pp. 9, 12, 14 (2) pp. 19-21 (4) pp. 31-33 (5) pp. 25-28

UNIT VI CARE AND USE OF EQUIPMENT 10 Hours

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Name the various basic drafting instruments, equipment and materials, and describe the use of each; Select the proper drawing material for specific types of drafting projects; Demonstrate the proper use of drawing instruments as a means of preparing accurate, readable, technical drawings.	A. Drawing Desk B. Drawing Board 1. types of boards a. bass wood b. soft pine c. metal edge 2. sizes of boards a. 18" x 24" b. 24" x 36" C. "T" Square 1. types of "T" squares a. plastic b. metal c. wood 2. sizes of "T" squares a. 24" b. 36" 3. parallel bar 4. drafting machine 5. aligning paper 6. drawing horizontal lines D. Drawing Paper/Film/Cloth 1. types of paper a. white b. tinted c. tracing d. vellum e. polyester 2. drawing paper sizes a. first series 1. 8½" x 11" 2. 11" x 17" 3. 17" x 22" 4. 22" x 34" 5. 34" x 44"	Read Chapter, answer study questions, adjust desk top to desired height/ angle.	Using a drawing board as an aid, demonstrate how it is to be used. With a "T" square as a visual aid, describe its parts and proper use. Using examples of various papers, explain the use of each.	(1) p. 20 (2) p. 44 (4) p. 15 (5) p. 7 (1) p. 20 (2) p. 44 (4) p. 10 (5) p. 8 (1) p. 21 (2) p. 45 (4) p. 25 (5) p. 7

UNIT VI CARE AND USE OF EQUIPMENT (Continued)

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
	b. second series 1. 9" x 12" 2. 12" x 18" 3. 18" x 24" 4. 24" x 36" 5. 36" x 48"			
	3. mounting the paper a. tape b. tacks	Mount paper on board.	Using a drawing board, "T" square, and tape, demonstrate the proper method for mounting the paper on the drawing board	
	E. Pencil 1. types of pencils a. Pentel b. lead-holder c. wood pencil	Disassemble and reassemble Pentel pencil and reload with lead.	Display various types of lead holders and pencils.	(1) p. 22 (2) pp. 45-47 (4) pp. 10-11 (5) pp. 9-10
	2. leads a. degrees of hardness b. sharpening	Sharpen pencil.	Demonstrate the correct method for disassembling, reassembling and loading the Pentel.	
	3. drawing lines	Draw horizontal lines.	Show correct method for sharpening leads.	
	4. lettering	Draw guide lines. Letter as assigned.		
	F. Triangles 1. types of triangles a. 30° - 60° b. 45°	Draw 30° and 60° lines. Draw 45° lines. Draw 15° and 75° lines using triangle combinations.	Use large scale model of triangles to demonstrate each one. These can be made from wood, paper, or plastic.	(1) p. 28 (2) p. 49 (4) p. 17 (5) p. 16
	2. sizes of triangles a. 8" b. 10" c. 12"			
	3. vertical lines	Draw vertical lines.		
	4. inclined lines	Draw inclined lines.		
	5. parallel lines	Draw parallel lines.		
	6. perpendicular lines	Draw perpendicular lines.		

UNIT VI CARE AND USE OF EQUIPMENT (Continued)

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
	G. Erasers 1. types of erasers a. art gum b. plastic 2. erasing shield a. metal b. plastic	Erase Lines. Erase line segments.	Demonstrate the proper method for using the erasing shield.	(1) pp. 31, 32 (2) p. 48 (4) p. 20 (5) pp. 14, 15
	H. Irregular curves 1. types of curves a. french curve b. adjustable curve c. ships curves 2. connecting plotted points	Draw irregular curves.		(1) pp. 41, 42 (2) pp. 62, 63 (4) p. 22 (5) pp. 21, 22
	I. Case Instruments 1. minimum requirement a. compass (1) types (a) large bow (b) small bow (c) drop bow (d) friction (e) beam	Adjust compass.	Show proper method of compass adjustment and compass handling.	(1) pp. 38-41 (2) pp. 57-62 (4) pp. 18, 19 (5) pp. 16-19
	(2) sharpening compass lead (a) chisel point (b) conical point	Sharpen compass lead. Adjust compass lead and needle point.		
	b. dividers (1) types (a) friction (b) proportional (2) transferring distances (3) dividing lines and arcs into equal segments	Adjust dividers. Transfer distances. Divide lines, arcs, and circles into equal segments		(1) pp. 40, 41 (2) pp. 57-59 (4) p. 20 (5) pp. 19, 20
	2. advanced equipment optional			

UNIT VI CARE AND USE OF EQUIPMENT (Continued)

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
	J. Scales 1. types of scales a. architects b. engineers c. metric d. combination 2. materials of scales a. wood b. plastic c. metal 3. shapes of scales a. triangular b. flat c. one bevel d. two bevel e. four bevel	Complete scale measuring exercise.	Large models of scales may be used for classroom demonstration.	(1) pp. 33-37 (2) pp. 53-57 (4) pp. 12-15 (5) pp. 10-13 Appendix
	K. Drawing Techniques 1. keeping drawings clean a. dusting powder b. fix-it spray 2. drawing straight lines a. horizontal b. vertical c. inclined d. parallel e. perpendicular f. angles g. pencil rotation 3. drawing curved lines a. arcs b. circles c. irregular curves 4. border lines and title strip 5. problem centering	Apply dusting powder to drawing surface. Spray finished drawing. Draw lines rotating the pencil at the correct inclination and direction. Draw arcs and circles. Construct border lines. Construct title strip. Center assigned problem. Complete student lab projects and assignments. Unit Test.	Demonstrate correct pencil angle and stroke direction. Show examples of lines with and without pencil rotation. Construct a large scale title strip for students to use as a reference.	(1) pp. 1-45 (2) pp. 42-67 (4) pp. 10-27 (5) pp. 6-24 Appendix

UNIT VII GEOMETRIC CONSTRUCTION 7 Hours

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Identify lines, angles, and geometrical figures commonly used in drafting; Demonstrate the proper use of geometric construction as a tool in developing technical drawings.	A. Importance of Geometry 1. a study of size and shape 2. solving drawing problems B. Application of Geometry 1. bisecting lines, angles and arcs 2. dividing lines, angles, and arcs into equal segments 3. erecting perpendiculars 4. parallel lines 5. construction of geometric figures a. square b. hexagon c. octagon d. pentagon 6. tangent arcs and circles	Read Chapter. Answer study questions. Bisect lines, angles and arcs. Divide lines, arcs, and angles into equal segments. Erect perpendiculars. Draw parallel lines. Construct squares, hexagons, octagons, and pentagons. Construct tangent arcs and circles. Complete student lab projects and assignments. Unit Test.	Construct models of different geometric shapes.	(1) p. 69 (2) pp. 68, 69 (4) p. 40 (5) p. 60 (1) pp. 69-81 (2) pp. 70-85 (4) pp. 40-54 (5) pp. 60-64

UNIT VIII ORTHOGRAPHIC PROJECTION/MULTIVIEW DRAWING/SHAPE DESCRIPTION 10 Hours

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Demonstrate the basic theory of orthographic projection, concept of planes of projection, the various views that are used; Complete orthographic projection and representation of features with various types of lines; Read and draw orthographic drawings; Properly layout the necessary views for an orthographic drawing.	A. Projection Box 1. front view 2. top view 3. right side view 4. left side view 5. rear view 6. bottom view	Read Chapter. Answer study questions.	Construct a projection box for demonstration purposes.	(1) pp. 86-88 (2) pp. 92-93 (5) pp. 32-33
	B. Drawing an Object Using Third Angle Projection 1. frontal 2. horizontal 3. profile	Use third angle projection. Show height, width, and depth projection between views.	Construct models of various problems to clarify students' understanding of surface relationship.	(1) pp. 84, 85 (2) pp. 90-91 (4) p. 39 (5) pp. 33, 34
	C. Choice of Views 1. most descriptive view 2. number of views necessary	Choose proper views. Choose proper number of views. Locate views properly.		(1) p. 88 (2) p. 95 (5) p. 34
	D. Location of Views			
	E. Mathematical layout of views 1. centering within working area 2. Spacing between views	Center a 3 view drawing.	Work an example problem step-by-step with students.	Appendix
	F. Alphabet of Lines 1. construction lines 2. border lines 3. object lines 4. hidden lines 5. center lines 6. guide lines	Use construction lines. Use object lines. Use hidden lines. Use center lines. Complete student lab projects and assignments. Unit Test	Show a comparison of good and bad line quality. Display chart showing alphabet of lines.	(1) pp. 25, 26 (2) p. 47 (4) pp. 71-73 (5) p. 121

UNIT IX DIMENSIONING/SIZE DESCRIPTION 20 Hours

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Demonstrate skills in the basic techniques of lines, symbols, and measuring systems used in dimensioning; Select and place the necessary dimensions and notes on the appropriate views of various shaped objects in accordance with accepted drafting practices; Apply precision dimensioning and tolerancing techniques to achieve a given accuracy requirement. 30	A. Importance of Dimensioning 1. accuracy in size description 2. completion of description of object	Read chapter. Answer study quesions.		(1) p. 141 (2) p. 107 (3) p. 59 (4) p. 48
	B. Alphabet of Lines 1. extension lines 2. dimension lines 3. center lines 4. leaders	Use extension lines. Use dimension lines. Use leaders.		
	C. Termination of Dimension Lines 1. arrowhead 2. dot 3. diagonal line	Draw arrowheads.		Appendix (1) p. 142 (2) p. 108 (4) p. 61 (5) p. 49
	D. Direction of Dimension Figures 1. unidirectional system 2. aligned system	Use the Unidirectional system. Use the aligned system.		(1) p. 144 (2) p. 111 (4) p. 60 (5) p. 48
	E. Dimensioning Angles 1. linear dimensioning 2. coordinate dimensioning	Dimension angles using the linear and coordinate methods.		(1) p. 145 (2) p. 117 (4) pp. 61-63 (5) pp. 48-49
	F. Dimensioning Arcs and Circles	Dimension arcs and circles.		(1) p. 146 (2) p. 114 (4) p. 61 (5) p. 48
	G. Finish Symbols 1. finish marks 2. surface roughness	Use finish symbols. Use surface roughness symbols.		
	H. Geometric Breakdown 1. size dimension 2. location dimension	Use size and location dimensions.		(1) pp. 148-151 (2) pp. 112 & 115 (4) pp. 61-63 (5) p. 48

UNIT IX DIMENSIONS/SIZE DESCRIPTION (Continued)

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
	I. Notes 1. local 2. general	Use local and general notes.		
	J. Dimension Figures 1. whole numbers a. feet b. inches 2. fractions	Dimension with whole numbers and fractions.		(1) p. 143 (2) p. 109 (4) p. 62 (5) p. 49
	K. Abbreviations 1. diameter 2. radius 3. required 4. chamber 5. countersink 6. counterbore 7. degree 8. material 9. reference 10. spot face 11. stock 12. thread 13. center line 14. millimeter	Use proper abbreviations.		(2) p. 120
	L. Methods of Dimensioning 1. consecutive 2. progressive	Use consecutive and progressive methods of dimensioning.		(1) p. 146 (2) p. 121 (5) p. 50
	M. Limit dimensioning	Use limit dimensioning.		(1) p. 160 (2) pp. 122-124
	N. Tolerance Dimensioning	Use unilateral and bilateral tolerance dimensioning.		
	O. Decimal System	Use decimal dimensioning.	Display decimal (equivalent) chart.	(1) p. 158 (2) p. 110 (4) p. 62

UNIT IX DIMENSIONING/SIZE DESCRIPTION (Continued)

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
	P. Metric System	Use metric dimensioning. Complete student lab projects and assignments. Unit Test.	Metric converter may be used to show relationship between metric and English measurements.	(2) pp. 56, 536-539 (4) p. 64 (5) p. 69

UNIT X PICTORIAL DRAWING 20 Hours

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Identify the various types of pictorial drawing to describe a given object; Convert an angular dimension of an orthographic to a linear dimension in a pictorial drawing; Draw a four-center approximate ellipse; Demonstrate the proper techniques in the drawing of various pictorial representations.	A. Use of Pictorial Drawings 1. To supplement working drawings 2. To enable laymen to visualize the design represented	Read chapter. Answer study questions. Collect examples of pictorial drawings.		(1) p. 307 (2) p. 230 (4) p. 97 (5) p. 72
	B. Types of Pictorial Drawings 1. oblique a. cabinet b. cavalier 2. isometric 3. perspective a. one point b. two point	Construct drawings in oblique cabinet and cavalier. Construct isometric drawings. Construct one or two point perspective drawings.	Display various types of pictorial drawings.	(1) p. 307 (2) p. 230 (4) p. 97 (5) p. 72 Appendix
	C. Oblique Axis 1. variation of direction 2. variation of angle	Use the various oblique axes.	Work a sample problem step-by-step with students.	(1) pp. 316-320 (2) p. 241 (4) pp. 100-102 (5) pp. 76-79
	D. Isometric Axis 1. variation of direction 2. angle of axis	Use the various angles of the isometric axis.		(1) pp. 311-312 (2) pp. 232-235 (4) pp. 98-100 (5) pp. 72-73
	E. Lines in an Isometric Drawing 1. isometric 2. non-isometric	Construct drawings with isometric and non-isometric lines.		(1) p. 311 (2) pp. 234-235 (4) p. 101 (5) p. 73
	F. Angles in Pictorial Drawings	Construct arcs.		(1) p. 311 (2) p. 235 (4) pp. 104-105 (5) p. 73
	G. Arcs and Circles in Pictorial Drawings 1. rhombus 2. four-center approximate ellipse	Construct circles in pictorial drawings.		(1) pp. 312-321 (2) pp. 236-242 (4) p. 103 (5) pp. 74-75

UNIT X PICTORIAL DRAWINGS (Continued)

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
	H. One-Point Perspective Drawing 1. front view projection a. horizon line b. vanishing point c. ground line 2. station point projection a. horizon line b. ground line c. vanishing point d. top view e. picture plane line	Construct one-point perspective drawings.		(1) pp. 322 & 326 (2) pp. 244-247 (4) p. 103 (5) p. 81
	I. Two-Point Perspective 1. ground line 2. picture plane line 3. horizon line 4. station point 5. two vanishing points 6. line of sight/true length line 7. top view 8. elevation view	Construct two-point perspective drawings. Complete student lab projects and assignments. Unit Test.		(1) p. 232 (2) pp. 246-251 (4) p. 103 (5) p. 80

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UNIT XI SECTIONAL DRAWINGS 15 Hours

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Draw the various types of sectional views and breaks and dimension each type; Identify the different materials by the use of section lining symbols; Describe the advantages of sectional drawings; Use the correct symbols and lines to communicate the interior details of an object through the use of standard sectioning properties.	A. Purpose of Sectional Drawings 1. show interior detail of an object 2. show the complex operation of an object	Read chapter. Answer study questions. Collect examples of sectional drawings from magazines.	Model cut-aways or object may be used to show interior detail such as small engines, values, etc.	(1) p. 193 (2) p. 173 (4) p. 89 (5) p. 55 (1) p. 193 (2) p. 175 (4) p. 92 (5) p. 56
	B. Cutting Plane Line 1. show edge of cutting plane 2. location of cutting plane 3. equal dash cutting plane line 4. alternate dash cutting plane line	Draw cutting plane lines.	Scribe students triangles with a line 1/8: from edge to be used for section lining.-- A large bow compass can be used for this procedure.	(1) p. 280 (2) p. 174 (4) p. 92 (5) p. 57
	C. Section Lining Symbols 1. general purpose symbol a. 45° angle section lines b. 1/8" section line spacing c. opposite angle section lining 2. other symbols-see reference material	Draw the various section lining symbols.		
	D. Types of Sections 1. full section 2. half section 3. offset section 4. broken-out section 5. removed section	Construct full, half, offset, broken-out, and removed section drawings.		(1) pp. 193-201 (2) pp. 176-182 (4) p. 92 (5) p. 56

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UNIT XI SECTIONAL DRAWINGS (continued)

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
	E. Conventional Breaks 1. "S" break a. pipe b. solid 2. rectangular break	Construct conventional breaks. Complete student lab projects and assignments. Unit Test.		(1) pp. 201-202 (2) pp. 184-186 (5) p. 56

UNIT XII AUXILIARY VIEWS 10 Hours

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Illustrate the purpose of auxiliary views and apply the principles of auxiliary projection in the construction of auxiliary view drawings;	A. Purpose of an Auxiliary 1. describes true size and shape of an inclined surface 2. describes special features of an object not perpendicular to the normal planes of projection	Read chapter. Answer study questions.	Large scale models may be used to show the relationship of inclined surfaces and the necessity for showing true size and shape.	(1) p. 213 (2) p. 137 (4) pp. 90-91 (5) p. 53
Explain the relationship of the auxiliary plane to the regular planes of projection;	B. Kinds of Auxiliary Views 1. primary 2. secondary			(1) p. 214 (2) p. 139 (4) pp. 90-91 (5) pp. 53-55
Demonstrate the use of three types of auxiliary reference planes; Illustrate a curved surface on an auxiliary plane.	C. Methods of Construction 1. folding plane line 2. center line 3. reference line			
	D. Steps in Construction	Construct auxiliary view drawings.	Work, step-by-step, sample problem with students.	(1) p. 215 (2) p. 139 (4) p. 93 (5) p. 54
	E. Plotting Curves	Plot curves on auxiliary view drawings. Complete student lab projects and assignments. Unit Test.		(1) p. 217 (2) p. 142 (4) p. 94

UNIT XIII THREAD REPRESENTATION 10 Hours

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Identify the common types of threaded fasteners; Describe the basic use of threaded fasteners; Make drawings of threads using the simplified and schematic types of thread representation; Give a brief outline of the development and functions of threaded fasteners.	A. Development and Functions of Threaded Fasteners 1. Archimedes 2. Leonardo DaVinci 3. Whitworth 4. William Sellers	Read chapter. Answer study questions.	Build a display board showing the various types of threaded fasteners.	(1) p. 239 (2) p. 192
	B. Standardization 1. American Standard screw threads 2. Unified screw threads 3. ANSI metric fasteners standard		Design bulletin board display depicting the development of the screw thread.	(1) pp. 250-251 (2) pp. 194-195
	C. Application of Screw Threads 1. hold parts together 2. adjust parts 3. transmit power		Build models depicting the applications of screw threads.	(2) pp. 192-193
	D. Thread Terminology 1. thread nomenclature 2. thread notes	Write thread notes.	Design a chart showing thread note nomenclature.	(1) pp. 240 & 251 (2) pp. 194-195 & 200
	E. Types of Threaded Fasteners 1. bolts a. hex head b. square head 2. Screws	Draw square and hex bolt heads.		(1) p. 239 (2) p. 193
	F. Schematic Representation 1. internal 2. external	Draw internal and external schematic thread representations.		(1) pp. 249-251 (2) p 198
	G. Simplified Representation 1. internal 2. external	Draw internal and external simplified thread representations. Complete student lab projects and assignments. Unit Test.		(1) p. 249 (2) pp. 198-199

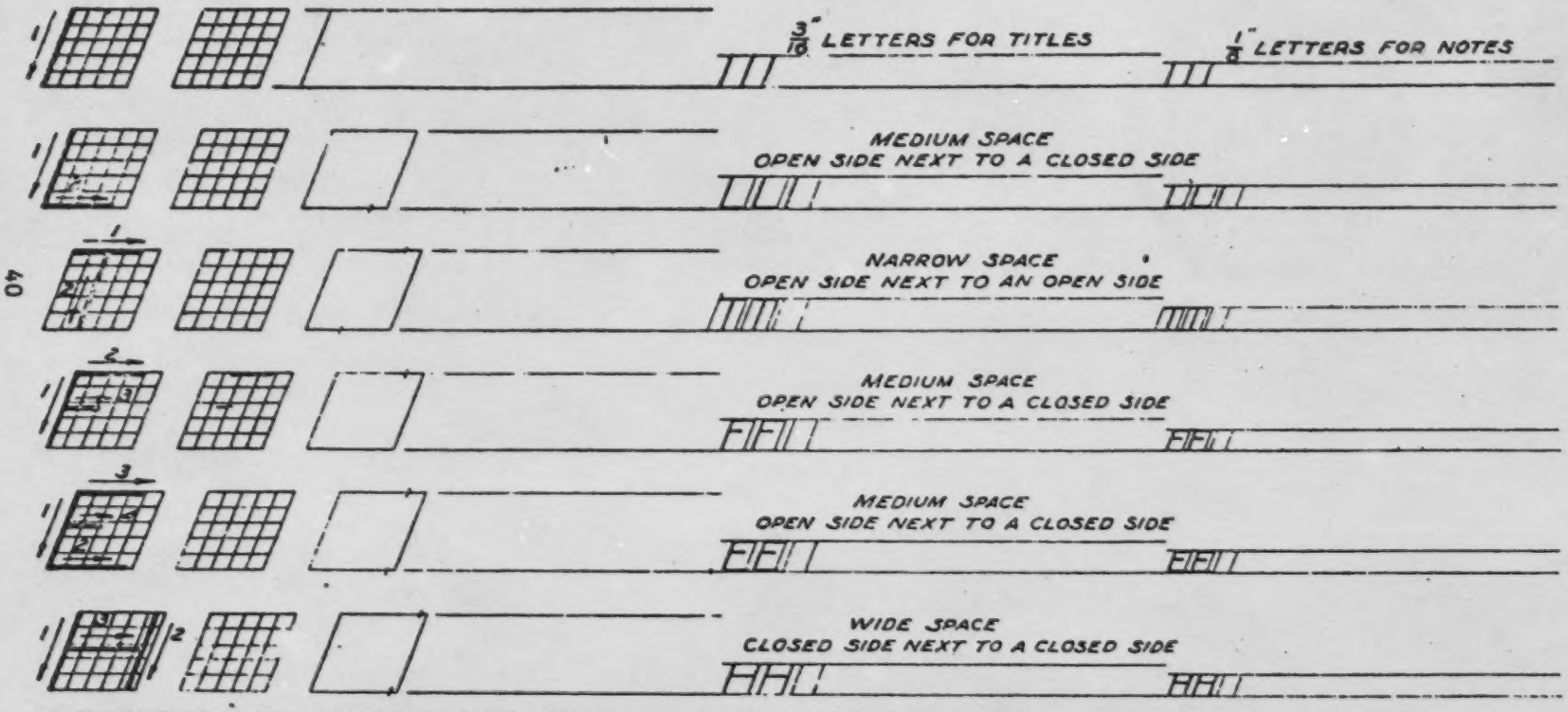
UNIT XIV WORKING DRAWINGS 45 hours

OBJECTIVES/TIME ALLOTMENT	TOPICS	STUDENT ACTIVITIES	TEACHER ACTIVITIES	RESOURCES
Upon completion of this unit, the student will be able to: Identify the major types of working drawings and describe the purpose of each; Draw an approved type of title block, bill of materials, and other schedules necessary in schedules necessary in making a finished working drawing. Produce a working drawing as assigned.	A. Application of Working Drawings 1. to show size, shape and specifications of an object 2. to show how an object is serviced or put together B. Methods of Layout for Working Drawings 1. detail drawing 2. assembly drawing C. Specifications 1. materials and parts list 2. notes	Read Chapter. Answer study questions. Layout detailed and assembly drawings. Layout materials and parts list. Letter all necessary notes on a working drawing. Complete student lab project and assignments. Unit Test	Display various professional drawings depicting detail and assmebly representations with notes, specifications, and title blocks.	(1) pp. 267-271 (2) pp. 214-215 (1) pp. 269-274 (2) pp. 216-222 (1) p. 279 (2) pp. 222-224

DATE
HOUR
QUALITY

GROUP I, L, T, F, E & H

THE FIRST GROUP OF LETTERS SELECTED FOR STUDY AND PRACTICE ARE THOSE FORMED BY INCLINED AND HORIZONTAL LINES. STUDY THE SHAPE, PROPORTION, AND ORDER OF STROKES FOR EACH LETTER. THEN TRY TO MAKE EACH LETTER AS NEARLY LIKE THE COPY AS YOU CAN.


3/16" LETTERS FOR TITLES
1/8" LETTERS FOR NOTES
MEDIUM SPACE
OPEN SIDE NEXT TO A CLOSED SIDE
NARROW SPACE
OPEN SIDE NEXT TO AN OPEN SIDE
MEDIUM SPACE
OPEN SIDE NEXT TO A CLOSED SIDE
MEDIUM SPACE
OPEN SIDE NEXT TO A CLOSED SIDE
WIDE SPACE
CLOSED SIDE NEXT TO A CLOSED SIDE

IN THE SPACE BELOW, FORM WORDS AND SENTENCES USING ONLY THE LETTERS PRACTICED ON THIS SHEET

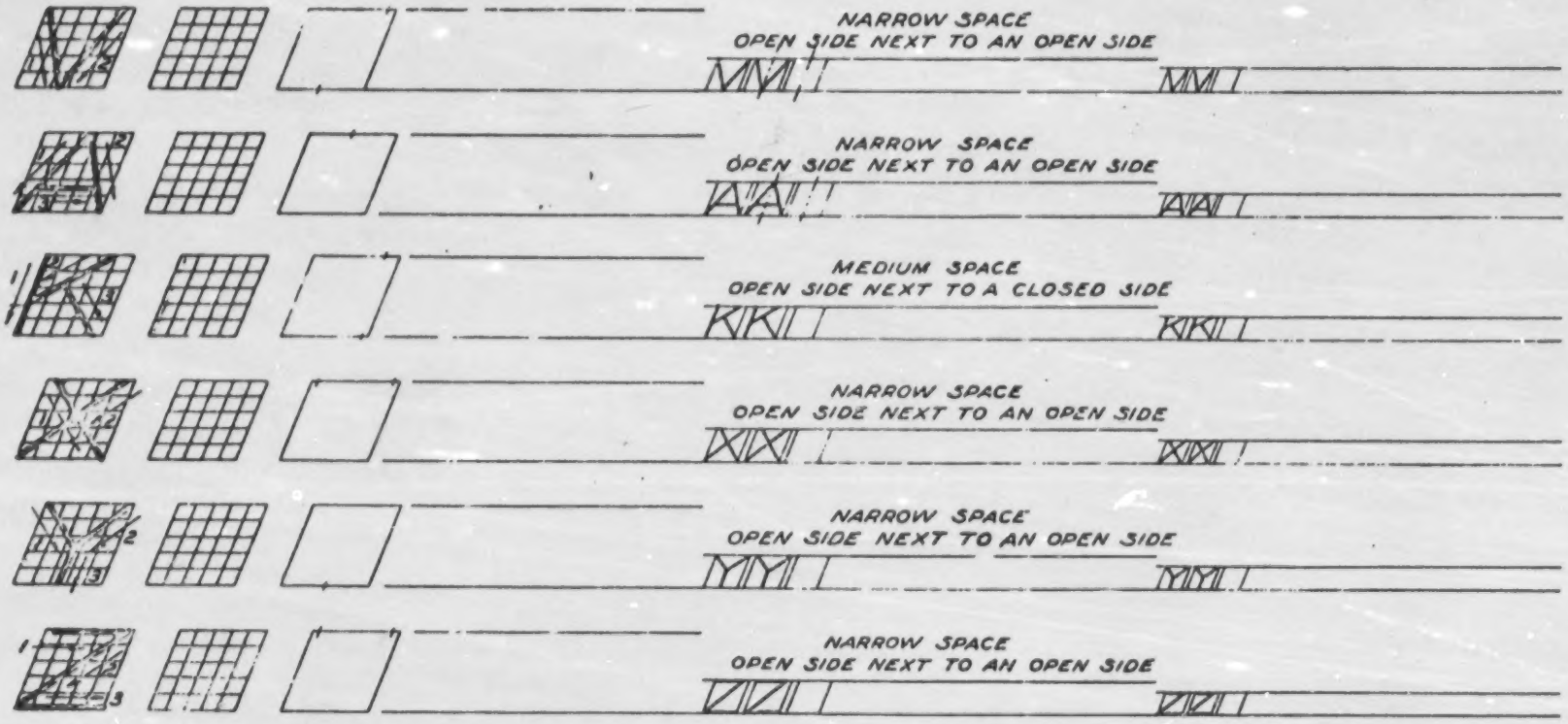
SCHOOL NAME

LETTERING SHEET 1

DATE
HOUR
QUALITY

GROUP V, A, K, X, Y & Z

THE SECOND GROUP OF LETTERS SELECTED FOR STUDY AND PRACTICE ARE THOSE WHICH HAVE STROKES VARYING FROM THE STANDARD 67½°


NARROW SPACE
OPEN SIDE NEXT TO AN OPEN SIDE
NARROW SPACE
OPEN SIDE NEXT TO AN OPEN SIDE
MEDIUM SPACE
OPEN SIDE NEXT TO A CLOSED SIDE
NARROW SPACE
OPEN SIDE NEXT TO AN OPEN SIDE
NARROW SPACE
OPEN SIDE NEXT TO AN OPEN SIDE
NARROW SPACE
OPEN SIDE NEXT TO AN OPEN SIDE

SCHOOL NAME

LETTERING SHEET 2

DATE
HOUR
QUALITY

GROUP D, J, U, P, R & B

THE FOLLOWING LETTERS ARE FORMED BY A COMBINATION OF CURVED AND SLANT STROKES. STUDY THE SHAPE, PROPORTION, AND ORDER OF STROKES OF EACH LETTER. MAKE THE LETTERS AS **NEARLY LIKE THE** COPY AS YOU CAN.

MEDIUM SPACE
OPEN SIDE NEXT TO A CLOSED SIDE.

DD DD

NARROW SPACE
SEMI-OPEN SIDE NEXT TO AN OPEN SIDE

JJ JJ

WIDE SPACE
CLOSED SIDE NEXT TO A CLOSED SIDE

UU UU

MEDIUM SPACE
OPEN SIDE NEXT TO A CLOSED SIDE

PP PP

MEDIUM SPACE
OPEN SIDE NEXT TO A CLOSED SIDE

RR RR

MEDIUM SPACE
OPEN SIDE NEXT TO A CLOSED SIDE

BB BB

SCHOOL

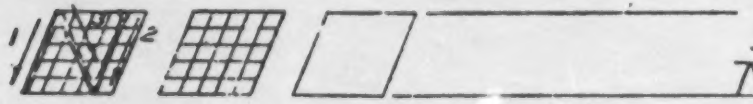
NAME

LETTERING SHEET 3

DATE
HOUR
QUALITY

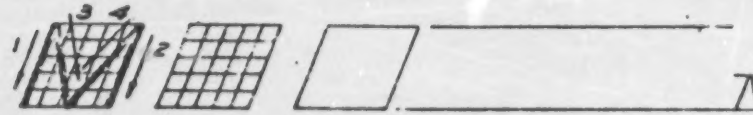
GROUPS N, M, & W — O, C, Q, G & S

THE LETTERS N, M AND W ARE STUDIED TOGETHER BECAUSE OF THE SIMILARITY OF STROKES AND **THE ADDED WIDTHS OF THE M AND THE W.**



WIDE SPACING
CLOSED SIDE NEXT TO A CLOSED SIDE.

NNN NNN



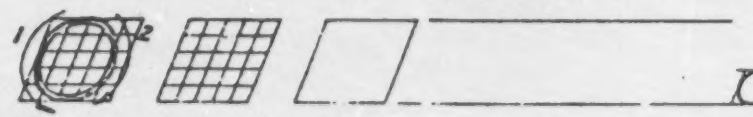
WIDE SPACING
CLOSED SIDE NEXT TO A CLOSED SIDE.

MMM MMM

NARROW SPACING
OPEN SIDE NEXT TO AN OPEN SIDE.

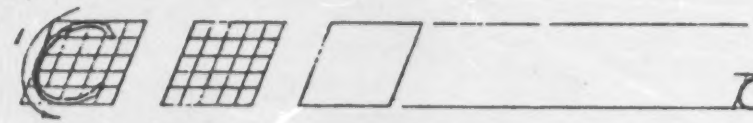
WWW WWW

THE LETTERS O, C, Q, G, & S ARE FORMED WITH CURVED STROKES.



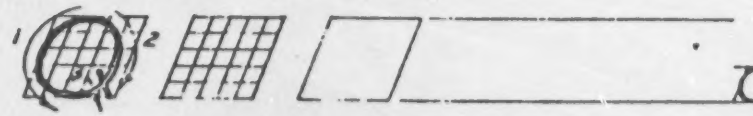
NARROW SPACING

OOO OOO



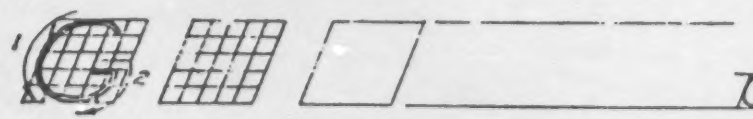
NARROW SPACING

CCC CCC



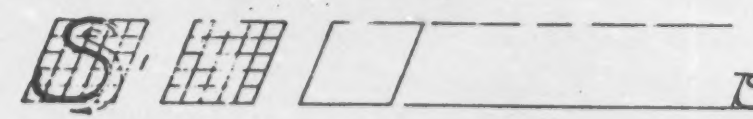
NARROW SPACING

QQQ QQQ



NARROW SPACING

GGG GGG



NARROW SPACING

SSS SSS

43

73

SCHOOL

NAME

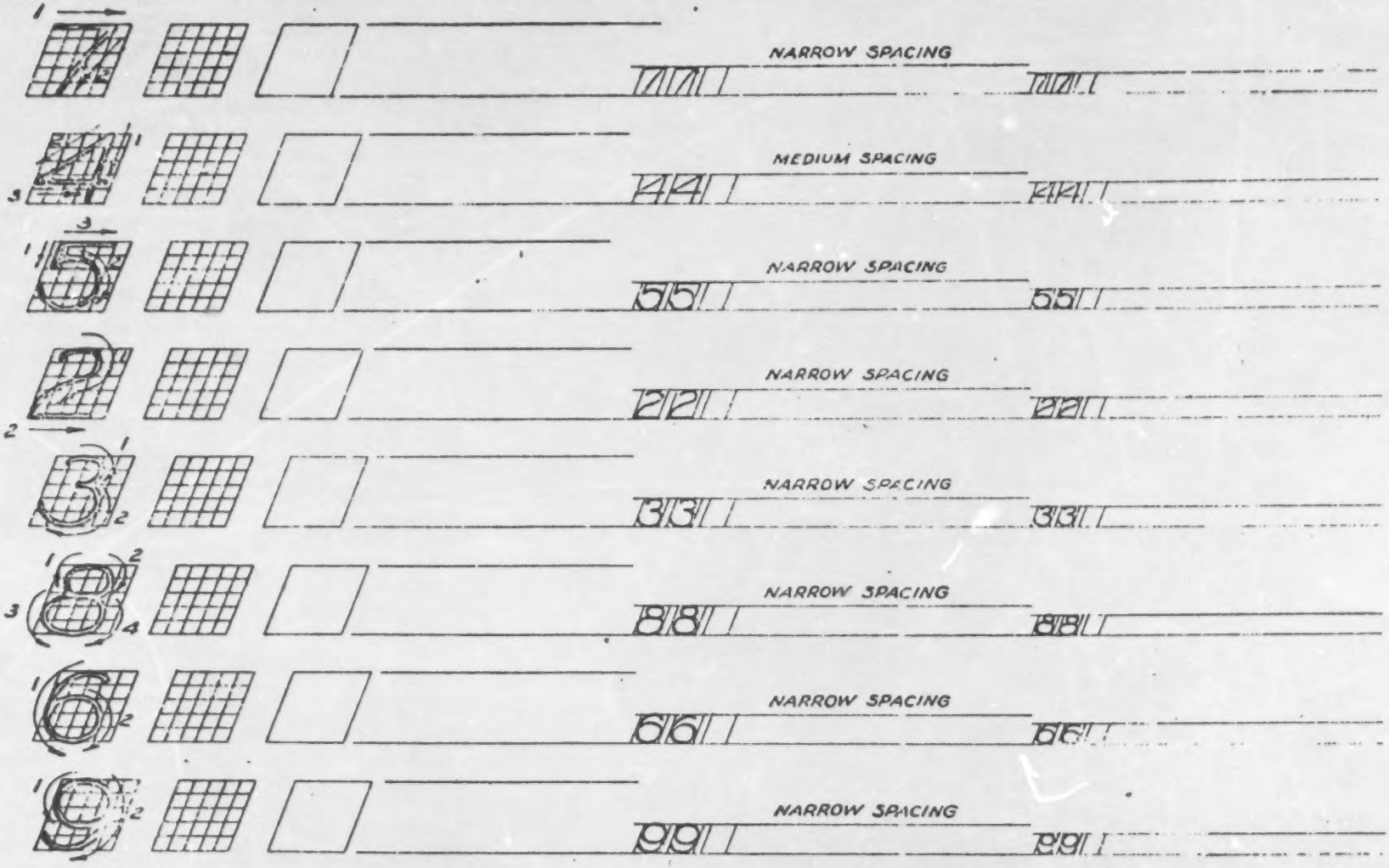
LETTERING SHEET 4

74

DATE
HOUR
QUALITY

NUMERALS

DIMENSION NUMBERS MUST BE CORRECTLY SHAPED TO CONVEY CLEAR, ACCURATE INFORMATION.



SCHOOL

LETTERING SHEET 5

NAME

KEY
N = NARROW SPACE
M = MEDIUM SPACE
W = WIDE SPACE

SPACING

HOUR
DATE
QUALITY

CARE SHOULD BE TAKEN TO GROUP THE LETTERS INTO WORDS SO THAT THE SPACES BETWEEN THE LETTERS APPEAR EQUAL.

YOU WILL FIND THAT YOU CAN IMPROVE YOUR SPACING BY OBSERVING THESE THREE SIMPLE RULES.

ONE- WHEN THE OPEN SIDE OF A LETTER (FOR EXAMPLE, E ~ OPEN SIDE), IS NEXT TO THE OPEN SIDE OF ANOTHER LETTER (FOR EXAMPLE, OPEN SIDE ~ T), USE A NARROW SPACE.

TWO- WHEN THE OPEN SIDE OF A LETTER IS NEXT TO THE CLOSED SIDE OF ANOTHER (FOR EXAMPLE, CLOSED SIDE ~ H), USE A MEDIUM SPACE.

THREE- WHEN A CLOSED SIDE IS NEXT TO A CLOSED SIDE (FOR EXAMPLE, HE), USE A WIDE SPACE.

THE SPACE BETWEEN WORDS IS EQUAL TO THE HEIGHT OF THE LETTER.

SCHOOL

NAME

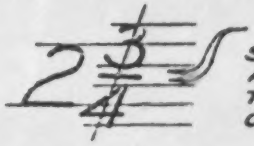
LETTERING SHEET 6

DIMENSIONING

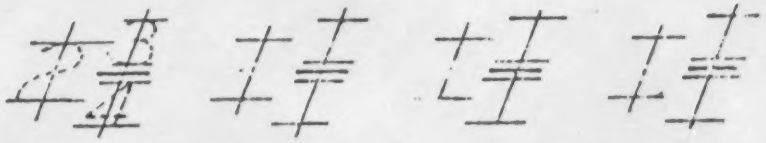
DATE
HOUR
QUALITY

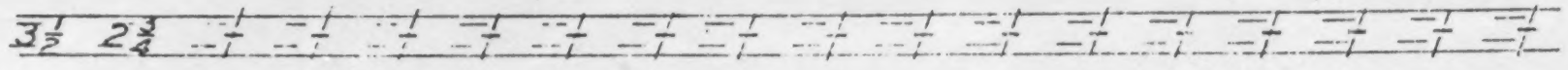
COMPLETE DIMENSIONS ARE MADE UP OF EXTENSION LINES, DIMENSION LINES, ARROWHEADS, FIGURES, NOTES AND FINISH MARKS.

THE RATIO OF THE HEIGHT OF THE FRACTION TO THE WHOLE NUMBER IS FIVE SPACES TO THREE.



A CLEAR SPACE SHOULD BE LEFT ABOVE AND BELOW THE DIVISION LINE OF THE FRACTION.



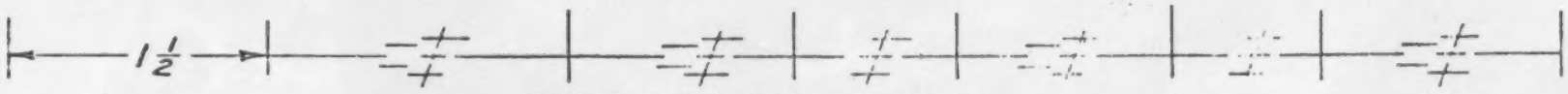


ENLARGED ARROWHEADS

ARROWHEADS ARE MADE SHARP AND NARROW. THE LENGTH IS THREE TIMES THE WIDTH.

STANDARD SIZE ARROWHEADS

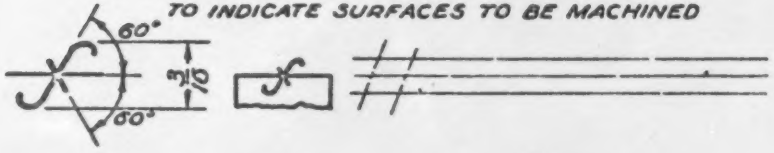
PRACTICE MAKING ARROWHEADS ON THE GIVEN DIMENSION LINES ABOVE. USE SLIGHTLY CURVED STROKES.



COMPLETE THE GIVEN DIMENSIONS

FINISH MARK

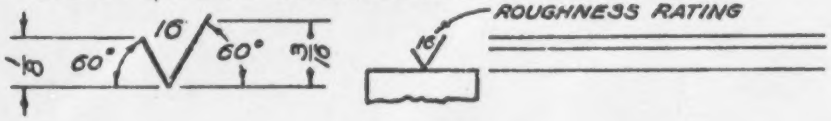
TO INDICATE SURFACES TO BE MACHINED



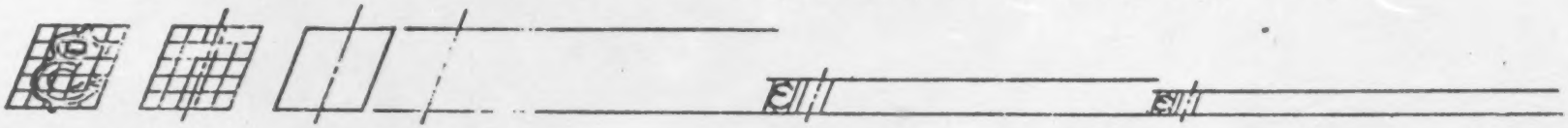
SURFACE ROUGHNESS SYMBOL

USED TO MEASURE QUALITY OR DEGREE OF ROUGHNESS

ROUGHNESS RATING



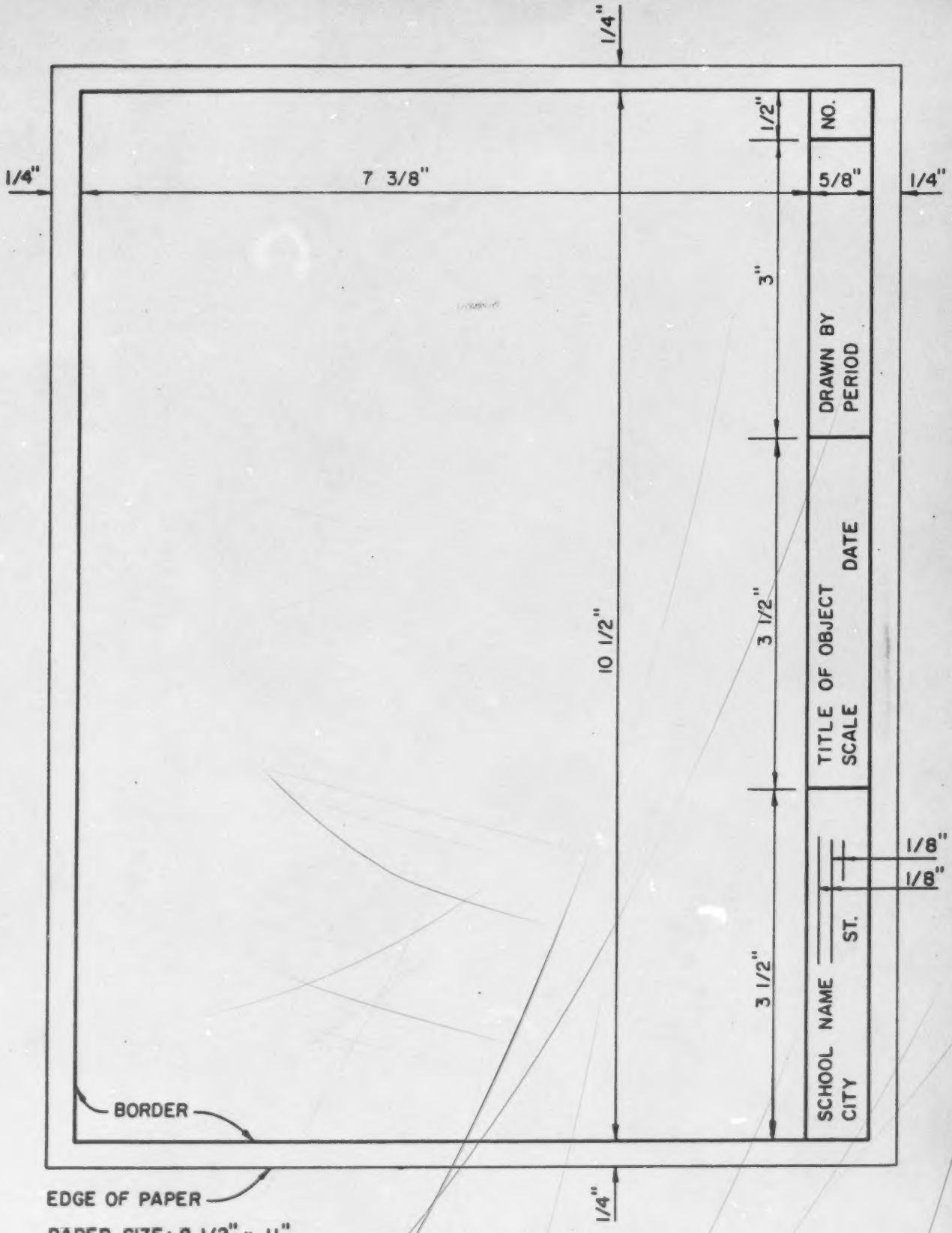
THE CHARACTER "&" IS THE SYMBOL FOR THE WORD AND.



SCHOOL

NAME

LETTERING SHEET 7


1/4"
1/4"
7 3/8"
1/4"
1/2"
NO.
5/8"
DRAWN BY
PERIOD
3"
TITLE OF OBJECT
SCALE
DATE
3 1/2"
10 1/2"
1/8"
1/8"
SCHOOL NAME
CITY
ST.
3 1/2"
BORDER
EDGE OF PAPER
1/4"
PAPER SIZE: 8 1/2" x 11"

Suggested Method for Centering a Three View Orthographic Projection Problem within the Working Space on a Drawing Sheet.

Horizontal Spacing:

Step 1: Add
Width of object
Space between views
+ Depth of object
Total space to be used

Step 2: Subtract the total space to be used from the horizontal working space.

Step 3: Divide the remainder by two (2), which will result in the horizontal spacing figure.

Vertical Spacing:

Step 1: Add
Height of object
Space between views
+Depth of object
Total space to be used

Step 2: Subtract the total space to be used from the vertical working space.

Step 3: Divide the remainder by two (2), which will result in the vertical spacing figure.

Horizontal Spacing:

Step # 1 Add

$$\begin{array}{r} 3 \\ 1 \\ +2 \\ \hline 6 \end{array}$$

Step # 2 Subtract

$$\begin{array}{r} 10\frac{1}{2} \\ -6 \\ \hline 4\frac{1}{2} \end{array}$$

Step # 3 Divide $4\frac{1}{2} \div 2\frac{1}{4}$

$2\frac{1}{4}$ Spacing Figure

Vertical Spacing:

Step # 1 Add

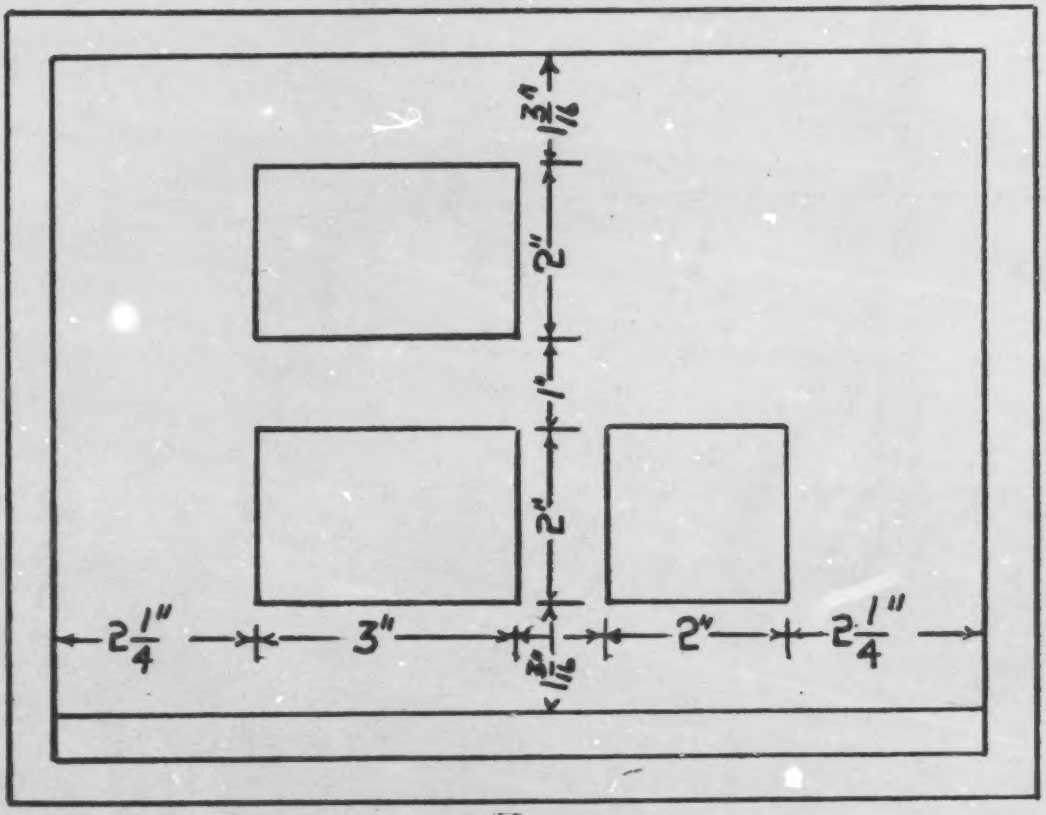
$$\begin{array}{r} 2 \\ 1 \\ +2 \\ \hline 5 \end{array}$$

Step # 2 Subtract

$$\begin{array}{r} 7\text{-}3/8 \\ 5 \\ \hline 2\text{-}3/8 \end{array}$$

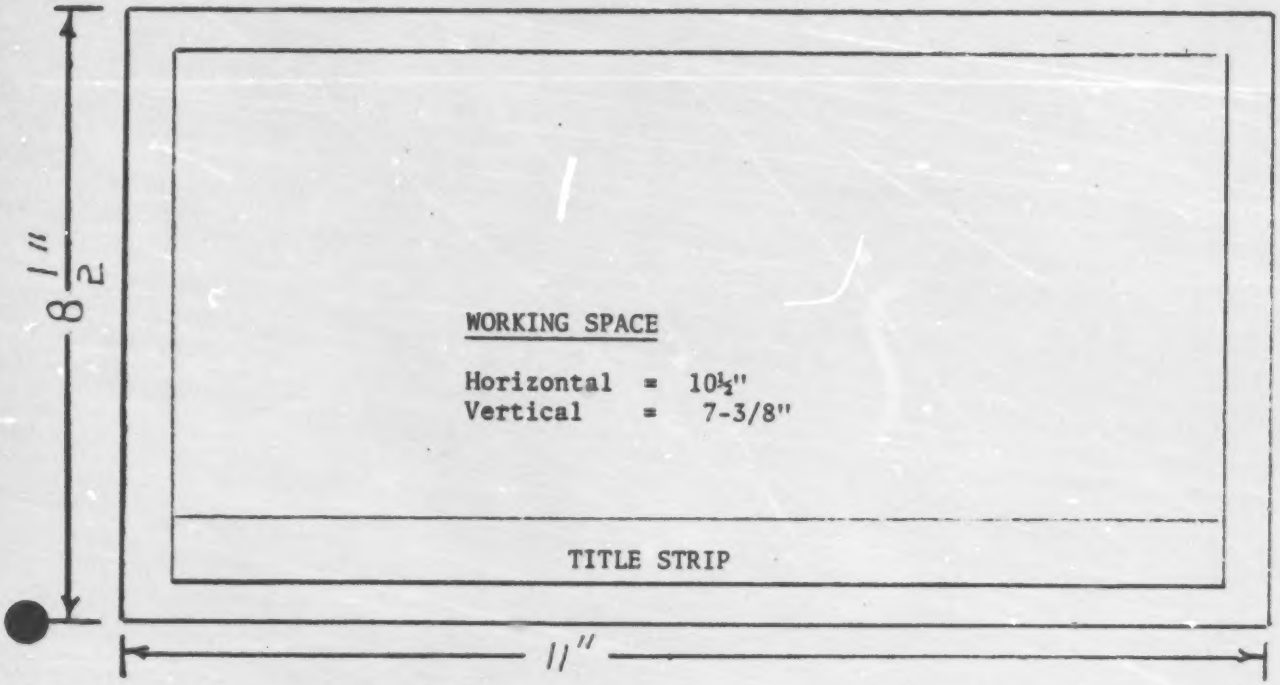
Step # 3 Divide $2\text{-}3/8 \div 2 = 1\text{-}3/16$

1-3/16 Spacing Figure

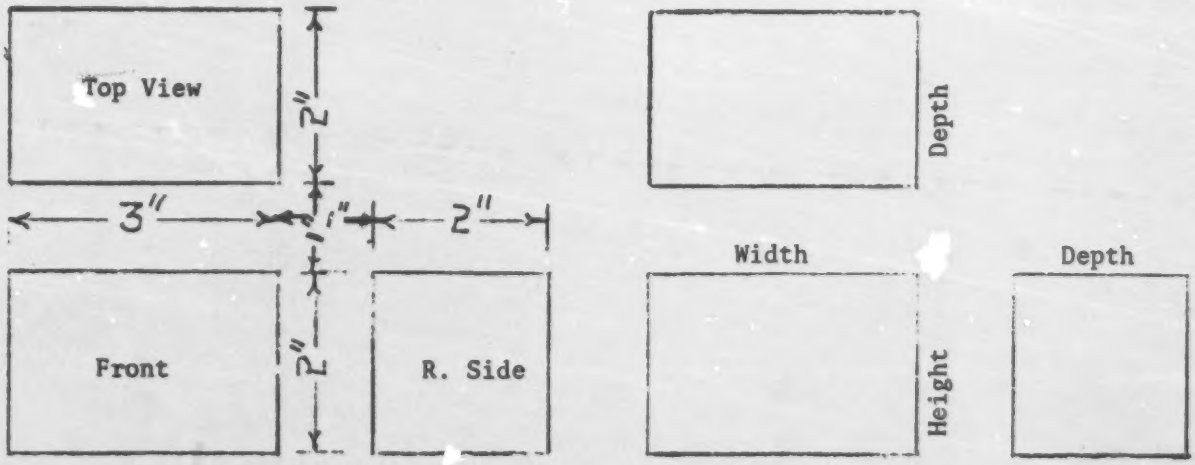


Centering Problem Example:

Paper Size 8½" x 11"
Border Line 1/4"
Title Strip Placed Horizontal at Bottom of Sheet



PROBLEM: To center a three view drawing.



(Space between views will-or should be-determined by the drawer.)
The space between the views may differ. The vertical space can be larger or smaller than the horizontal space.

Suggested Method for Centering an Isometric Drawing Within the Working Space on a Drawing Sheet.

Horizontal Centering

Step 1: Using light construction lines, layout the width and depth of the object (as shown in Figure 1).

Step 2: Measure the distance "x" (as shown in Figure 2) and divide this figure by 2.

Step 3. This distance (1/2x) is now laid-off from the vertical border lines toward the center of the paper (as shown in Figure 3). This will center the problem horizontally.

Vertical Centering

Step 1: Layout the height and depth of the object (as shown in Figure 4).

Step 2: Measure the distance "Y" (as shown in Figure 5) and divide this figure by two.

Step 3: This distance (½Y) is now laid-off from the top border line and the top line of the title strip (as shown in Figure 6). This will center the problem horizontally.

Placing the Problem on the Sheet

Step 1: Transfer distance "A" (as shown in Figure 7). This will locate the starting point of the isometric axis.

Step. 2: From the starting point found in Step 1, construct the isometric axis and develop the isometric box (Figure 8), from which the problem will be further developed.

Fig. 1

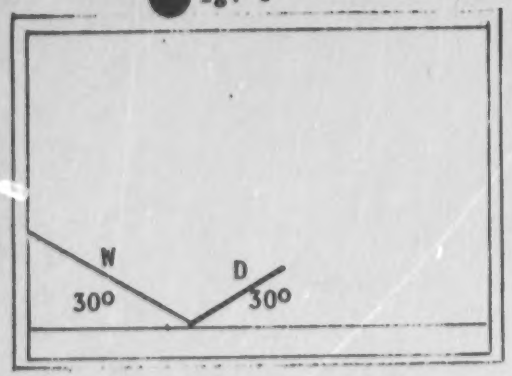


Fig. 2

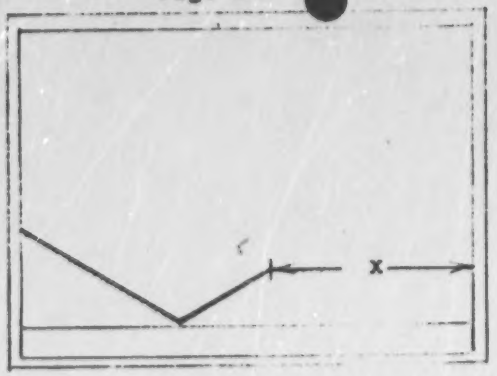


Fig. 3

Fig. 4

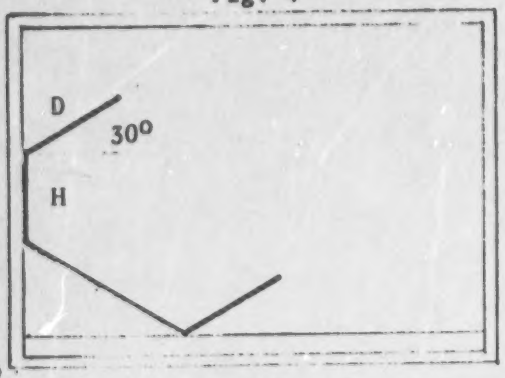


Fig. 5

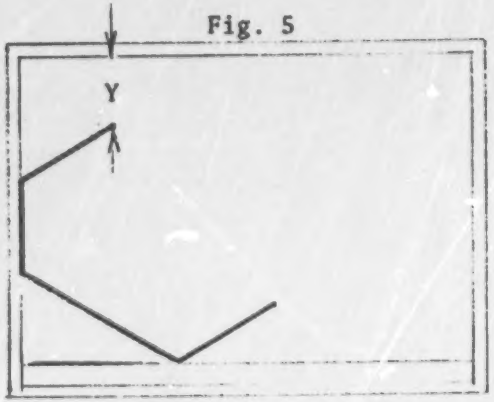


Fig. 6

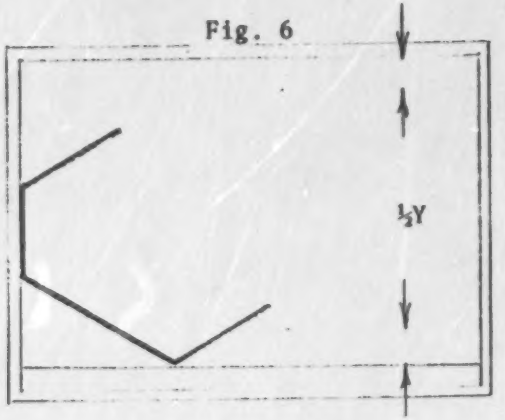


Fig. 7

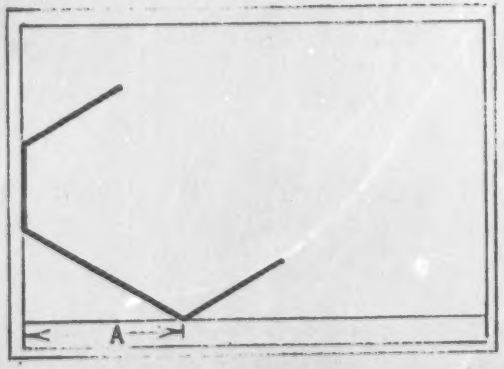


Fig. 8

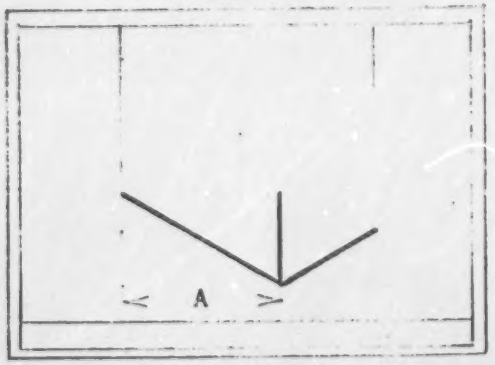
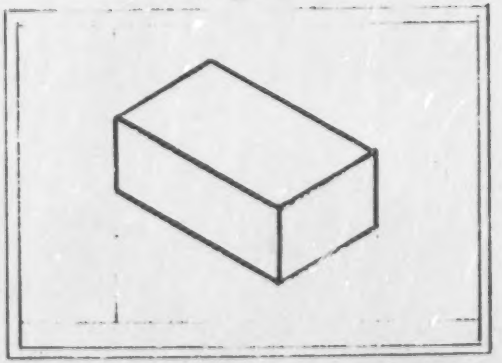


Fig. 9



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COURSE EVALUATION

Purpose:

This evaluation is an effort by your instructor to ascertain his/her teaching effectiveness and the usefulness of course materials. It is designed to provide suggestions on how the course can be improved and be made more relevant to students' needs. Your cooperation will be greatly appreciated.

Instructions:

Below are a list of qualities dealing with the course and the instructor. You are asked to evaluate these qualities on a scale of four to one. Four is the highest ranking, and one is the lowest ranking. Any comments you wish to add may be included on the back of this sheet.

		Rankings			
		Highest		Lowest	
1.	The class sessions and lectures were well organized.	4	3	2	1
2.	The course textbook was very helpful as a learning device.	4	3	2	1
3.	The course was interesting and enjoyable.	4	3	2	1
4.	The course material satisfied my educational needs in this area.	4	3	2	1
5.	The tests used in the course contributed to greater learning.	4	3	2	1
6.	Material presented in the course was easy to learn and to apply.	4	3	2	1
7.	The instructor displayed a sense of professionalism and dignity in the class.	4	3	2	1
8.	The instructor seemed personable and genuinely interested in students.	4	3	2	1
9.	The instructor has a thorough knowledge of his subject matter.	4	3	2	1
10.	The variety of presentational methods was good.	4	3	2	1
11.	The instructor displayed a sense of humor.	4	3	2	1
12.	The instructor was clear in his explanation of course material and assignments.	4	3	2	1
13.	The instructor always seemed prepared for class meetings.	4	3	2	1
14.	The instructor always displayed a pleasant appearance in dress.	4	3	2	1
15.	The instructor encouraged all students to participate.	4	3	2	1

GRADING CHART FOR TECHNICAL DRAFTING

		Neatness	Accuracy	Line Quality	Lettering
Work is above Criticism in every item	A				
Lacking slightly in not more than 1 item	B				
Lacking slightly in not more than 2 items	C				
Lacking seriously in one item or generally lacking	D				
This kind of work should be done over D.O. Grade		Crumpled, Inaccurate	Ragged edges, Do not roll drawings		Carelessly lettered, Omitted drawing Guide lines.

Other considerations: Industry, speed, judgment, application, general knowledge, consideration of others, and teacher.

Neatness - The absence of undesirable marks from:

1. Measuring
2. Needlepoints
3. Tacking
4. Erasures
5. Finger marks
6. High spot rubs (T-square)
7. Crumpling from rolling
8. Soil or markings in any way

Accuracy - The measure of perfection in:

1. Tangency
2. Measurement
3. Match-line spacing
4. Dimensioning
5. Balancing views
6. Projection
7. Proportion of symbols and other representations.

Line Quality - The quality of and conventional correctness of lines:

1. Construction conforming to standards
2. Weight conforming to standards
3. Uniform weight of same class lines
4. Clean cut and not worked over
5. Limitations correct for center lines, extension, and other lines with breaks.

Lettering - The quality of the free-hand work on plate:

1. Standard inclination (vertical or incline lettering)
2. Consistent inclination
3. Standard height for purpose
4. Consistent height
5. Guide lines used consistently throughout drawing
6. Lettering composition--correct spacing
7. Work spacing as necessary to drawing
8. Spelling

BASIC TECHNICAL DRAFTING

Suggested projects and drawing assignments for Basic Technical Drafting course:

Unit 4 - Lettering

Handout sheet - (Appendices 1, 2, 3, 4, 5, 6, and 7)

Unit 5 - Sketching Problems

Fig. 2-75 (2,38)
Fig. 2-82 (2,38)
Fig. 2-83 (2,38)
Fig. 2-93 (2,38)

Unit 6 - Core and Use of Equipment

Fasten drawing sheet to board. Fig. 3-9 (2,46)
Draw lines with T-square and triangle. Fig. 3-23 (2,52)
Divide circle into 24 angles of 15°. Fig. 3-23 (2,52)
Draw parallel lines. Fig. 3-24 (2,52)
Draw perpendicular lines. Fig. 3-25 (2,53)
Complete scale exercises. Handout sheet. (Appendix 8)
Draw circles and arcs. Fig. 3-44 (2,59)
Draw sheet metal pattern. Fig. 3-58 (2,64)
Draw template. Fig. 3-65 (2,64)
Draw international danger road sign. Fig. 3-68 (2,64)
Draw highway warning sign. Fig. 3-69 (2,64)
Draw armature support. Fig. 3-72 (2,65)
Draw round gasket. Fig. 3-75 (2,65)

Unit 7 - Geometric Construction

Bisect a straight line. Fig. 4-4 (2,71)
Bisect an angle. Fig. 4-15 (2,74)
Divide a line into equal spaces. Fig. 4-5 (2,71)
Erect a perpendicular. Fig. 4-7 (2,72)
Draw parallel lines. Fig. 4-12 (2,73)
Draw a square. Fig. 4-23 (2,77)
Draw a pentagon. Fig. 4-27 (2,78)
Draw a hexagon. Fig. 4-28, 4-29 (2,78)
Draw an octagon. Fig. 4-31 (2,79)
Construct an arc tangent to two straight lines. Fig. 4-38 (2,81)
Construct an arc tangent to two given arcs. Fig. 4-40 (2,82)

Unit 8 - Orthographic Projection/Multi-View Drawing - Shape Description

Draw step block. Fig. 5-38 (2, 102)
Draw V-block. Fig. 5-40 (2, 102)
Draw cradle. Fig. 5-43 (2,102)
Draw shaft support. Fig. 5-53 (2, 104)
Draw swivel arm. Fig. 5-55 (2,104)

Unit 9 - Dimensioning-- Size Description

Draw and fully dimension dovetail slide. Fig. 5-48 (2,104)
Draw and fully dimension base. Fig. 5-52 (2,104)
Draw and fully dimension double shaft support. Fig. 6-87 (2,136)
Draw and fully dimension pipe support. Fig. 6-91 (2,136)
Draw and fully dimension stop plate. Fig. 6-92 (2,136)

Unit 10 - Pictorial Drawing

Draw an oblique of the spacer. Fig. 12-58 (2,253)
Draw an oblique of the idler spool. Fig. 12-58 (2,253)
Draw an oblique of the bearing. Fig. 12-60 (2,255)
Draw an isometric of the concrete step. Fig. 12-57 (2,252)
Draw an isometric of the brace. Fig. 12-57 (2, 252)
Draw an isometric of the cube. Fig. 12-14 (2,236)
Draw an isometric of the post support. Fig. 12-28 (2, 254)
Draw a 1-point perspective of letter N. Fig. 12-61 (2, 256)
Draw a 2-point perspective of V-block. Fig. 12-61 (2, 256)

Unit 11 - Sectional Drawings

Draw the break symbols for cylinders and pipes. Fig. 9-46 (2, 186)
Draw "A" full section. Fig. 9-49 (2, 187)
Draw "D" half section. Fig. 9-49 (2, 187)
Draw "J" full section. Fig. 9-49 (2, 187)
Draw "L" half section. Fig. 9-49 (2, 187)
Draw "E" offset section. Fig. 9-50 (2, 188)
Draw "K" full section. Fig. 9-50 (2, 189)
Draw adjusting plate-broken-out. Fig. 9-55 (2, 189)

Unit 12 - Auxiliary Drawings

Draw auxiliary drawings for the six problems. Fig. 7-32 (2,150)

Unit 13 - Thread Representation

Draw schematic representation of Fig. 10-48. (2, 210)

Unit 13 (Continued)

Draw simplified representation of Fig. 10-49. (2, 210)
Draw simplified representation of regular hexagonal nut. Fig. 10-51(2, 211)
Draw schematic representation of regular square bolt. Fig. 10-53 (2,211)

Unit 14 - Working Drawings

Draw the trammel. Fig. 11-20 (2, 226)
Draw the level. Fig. 11-25 (2,228)

EXAMPLE OF DAILY LESSON PLAN

COURSE: BASIC TECHNICAL DRAFTING

TEACHER:_____ GRADE 9 - 12

LESSON TITLE:_____ DATE_____

RESOURCES AND MATERIALS:

TEXTBOOK:
- ___MECHANICAL DRAWING 8th ED - FRENCH
- ___ARCHITECTURE - KICKLIGHTER
- ___MACHINE DRAFTING - YANKEE

CHAPTER_____
PAGE_____

STUDENT NEEDS:
- ___DRAWING EQUIPMENT
- ___PENCIL/PEN
- ___NOTEBOOK
- ___TOOL TRAY
- ___DRAWING BOARD
- ___REFERENCE MATERIAL
- ___TEXT BOOK
- ___HANDOUT SHEETS

TEACHER NEEDS:
- ___BLACKBOARD
- ___OVERHEAD
- ___CASSETTE PLAYER
- ___MODELS/WOOD/METAL/ PAPER
- ___TRANSPARENCIES
- ___CHALK/MARKERS
- ___TEXT/ANSWER SHEET
- ___16 mm PROJECTOR
- ___HANDOUT SHEETS
- ___FILMSTRIP PROJECTOR
- ___SLIDE PROJECTOR

ANTICIPATORY SET: INSTRUCTIONAL
___PRE-VIEW ___REVIEW ___QUESTIONS/ANSWER SHEET ___DISCUSSION

BEHAVIORAL OBJECTIVE: STUDENT WILL BE ABLE TO:

INPUT:
- ___EXPLANATION
- ___READ CHAPTER
- ___DEMONSTRATION
- ___COMPLETE HANDOUT SHEET
- ___ILLUSTRATION
- ___AUDIO-VISUAL PRESENTATION
- ___CHALKBOARD DEMONSTRATION AND DRAWING PRESENTATION
- ___LECTURE/DISCUSSION
- ___GROUP WORK
- ___DISCUSSION/TEACHER/ STUDENT

CHECK FOR UNDERSTANDING:
___ORAL SIGNALS/QUESTIONS ___SILENT SIGNALS ___WRITTEN SIGNALS

GUIDED PRACTICE:

TEACHER ACTIVITIES:
- ___SUPERVISE INDIVIDUAL LABORATORY (STUDENTS) WORK STATION
- ___SUPERVISE GROUP LABORATORY WORK
- ___SOLVING DRAWING ASSIGNMENT ___PLAN___
- ___ANSWERING STUDY QUESTIONS CHAPTER___ PAGE___
- ___SKETCHING/SOLVING PROBLEM ASSIGNMENT

___INDEPENDENT PRACTICE

EVALUATION/CLOSURE:
___QUIZ ___TEST ___UNIT QUESTIONS/ANSWERS ___PROBLEM SOLVING SKETCHES
___STUDENT LABORATORY PROJECTS/ASSIGNMENTS
___HOMEWORK PRACTICE ASSIGNMENTS

HOMEWORK ASSIGNMENT:
- ___READ CHAPTER___ PAGE___
- ___COMPLETE HANDOUT SHEET
- ___COMPLETE SKETCH SHEET
- ___ANSWER STUDY QUESTIONS CHAPTER___ PAGE___

COMMENTS:

NOTES:

SCALE EXERCISE

SCALE	LENGTH	RATIO
6" = 1'-0"		
1/2" = 1'-0"		
3/16" = 1'-0"		
1 1/2" = 1'-0"		
3/8" =1'-0"		
1/4" = 1'-0"		
3/32" = 1'-0"		
3/4" =1'-0"		
3" = 1'-0"		
1" = 1"		

Measure the distance between the vertical lines using the given scale. Place the length measurement in the center blank and the ratio above the line on the right.

Suggested Classroom Rules and Regulations Students Should Follow

1. Talking is absolutely forbidden:
   whenever the teacher is talking.
   whenever any test, examination or quiz is in progress.
   whenever any other student has the floor.
   whenever there is any kind of audio-visual presentation in progress, such as a film, filmstrip, etc.

2. Do not talk loudly.

3. Do not make disrespectful remarks to the teacher.

4. Do not bring radios, tape players, or other entertainment devices to class.

5. Do not leave paper or trash in the desks or on the floor.

6. Do not mark or otherwise deface school property. This includes desks, floors, walls, chairs, books, etc.

7. Do not move to another seat other than the one assigned to you without prior approval of the teacher.

8. Do not be tardy to class.

9. Do not leave the classroom without a hall pass.

10. Do not congregate in the doorway before or after class.

11. Do not enter the office and storage room, and do not open cabinets without prior permission to do so.

12. Do all work in class under the teacher's supervision. Only supplementary work or drawings may be done outside of class.

13. Complete all makeup work no later than five days after an absence.

14. Do not do work from other classes in the drafting class without special permission.

15. Other than for official meetings, do not leave to go to another teacher's room without a written note from that teacher and approval from the drafting teacher.

16. Use cover sheets for all quizzes and tests.

17. Use five minutes at the end of each hour to cleanup and put away equipment and materials (only five (5) minutes)--a signal will be given by the teacher for the start of this cleanup.

18. Remain seated at your desk until dismissed by the teacher (not when the bell rings).

19. Be sure that your desk and stool is in order before leaving the class.

20. Enter and exit through the front door only.

BASIC TECHNICAL DRAFTING

SUGGESTED STUDENT EXPECTATIONS

I. Students will be expected to bring the following materials to class each day:

1. notebook
2. pencil
3. textbook (when issued)
4. drawing equipment and materials

II. Students will be expected to be in their assigned seats and prepared to begin class when the tardy bell rings.

III. Students will be courteous and respectful to their classmates as well as to the teacher during class activities by listening while others speak.

MEASURING ACHIEVEMENT

The following are sample or suggested test questions for each unit of study. The following test questions are by no means complete nor exhaustive. They are merely a representation of some of the better material available. Also included are suggested directions for examinations.

General Directions

This test consists of five parts: true and false, matching, multiple choice, completion, and listing. There will be 50 minutes allotted for the test. Read the instructions carefully. If there are questions, please ask them before the class starts the test. If there are urgent questions while taking the test, raise your hand. Upon completion of the test, turn your paper over and remain quietly in your seat. Begin.

True and False Test:

Read the complete statement. If the statement is true, circle the T; if the statement is false, circle the F.

Matching:

In the blank at the left of the item number, record the letter of the description in the right column which identifies the item.

Multiple Choice:

In the blank at the left of the item number, record the letter of the answer that makes the statement correct.

Completion:

Fill in each blank with a word or words that complete(s) the statement correctly.

Listing:

In the spaces provided, list concisely the information called for in each question.

Sample Test Layout

Date_____

Name_____

Period_____

Seat Number_____

Test Number_____

Score_____ Letter Grade_____

BASIC TECHNICAL DRAFTING

Exam Unit II

Safety in the Drafting Room

1. List four pieces of equipment that can be hazardous when used improperly.

   1. 3.
   2. 4.

2. List four personal safety practices that are to be followed.

   1. 3.
   2. 4.

3. List four things that can create hazards related to improper student behavior and room arrangement.

   1. 3.
   2. 4.

Sample Test Questions for Unit 4
Lettering Techniques

T F 1. Guide lines for lettering should be drawn so that they are barely visible.

T F 2. Guide lines should be erased once the lettering is constructed.

T F 3. "Single stroke" means that the widths of the lines which form the letters do not vary.

T F 4. To keep your pencil point sharp when lettering, the pencil should be rotated every few strokes.

T F 5. Guide lines should be drawn for both the tops and bottoms of letters.

T F 6. A combination of both vertical and inclined lettering may be used on any one drawing.

T F 7. The center column of holes on the Ames lettering guide is for guide lines for fractions.

T F 8. Pencil letters can be best made with a medium-soft pencil with a conical point.

9. The Ames lettering device produces _____ guide lines for guide lines for constructing fractions.

10. The complete height of a fraction is _____ the height of the whole numeral.

11. The widest letter in the alphabet is the _____.

12. On working drawings, letters are generally made _____ high.

13. For capital letters, the central horizontal stroke of the letter B, E, H, and F are drawn slightly _____ the center line.

14. To give a pleasing appearance, the area between each letter must appear to be _____.

Unit 4 Lettering Techniques

Answers to sample test questions.

1. T
2. F
3. T
4. T
5. T
6. F
7. T
8. T
9. Five
10. Twice
11. W
12. 1/8"
13. Above
14. Equal

100

Sample Test Questions for Unit 5
Sketching

T F 1. In freehand sketching, long lines are generally drawn in a single stroke from left to right.

T F 2. Sketches are drawn in proportion; however, in some cases a freehand sketch is drawn approximately to scale on section paper.

T F 3. When drawing a straight line, it helps to keep your eye on the pencil point and the beginning point.

T F 4. The isometric sketch is the most used pictorial sketch.

____ 5. One of the following is not needed for sketching:

(a) any pencil
(b) pencil eraser
(c) compass
(d) paper

____ 6. One of the following is not a good way to sketch straight lines:

(a) freely sketched
(b) dash to dash
(c) overlapping dashes
(d) with a straight edge

____ 7. What type of pencil point is best for sketching?

(a) chisel
(b) flat
(c) conical
(d) none of these

Unit 5 Sketching

Answers to sample test questions.

1. F
2. T
3. F
4. T
5. C
6. D
7. C

Sample Test Questions for Unit 6
Care and Use of Equipment

1. A pencil is rotated when drawing a line:

   (a) to relieve pressure on the fingers
   (b) to prevent wear and tear on the lead
   (c) to produce a uniform line
   (d) to make the pencil point last longer.

2. A divider is used to:

   (a) transfer a dimension
   (b) take measurement directly from the architect scale
   (c) draw circles
   (d) prick holes in the paper.

3. Triangles are used in conjunction with the T-square:

   (a) to draw vertical lines
   (b) to draw margin lines
   (c) to draw lines of 90^{o}, 60^{o}, 45^{o}, 30^{o}, 15^{o}, 75^{o}
   (d) all of the above.

4. When drawing a circle the compass is set to:

   (a) half the radius
   (b) half the circumference
   (c) half the diameter
   (d) the diameter.

5. The irregular or French curve is used for:

   (a) drawing circles
   (b) drawing non-circular curves
   (c) (a) and (b) above
   (d) none of the above.

Unit 6 Care and Use of Equipment

Answers to sample test questions.

1. C
2. A
3. D
4. C
5. B

Sample Test Questions for Unit 7
Geometric Construction

1. Construct a line parallel to the given line AB and through point C.

2. Construct a line parallel to the given line and 1/2" perpendicular distance from it.

3. Construct a line perpendicular to the given line.

4. Construct a 7/8" diameter circle tangent to the given line.

5. Construct a hexagon with the distance across flat equal to 1".

Sample Test Questions for Unit 8
Orthographic Projection (Shape Description)

1. Which of the following planes is not a principal plane in orthographic projection?

   (a) horizontal
   (b) profile
   (c) oblique
   (d) frontal

2. In orthographic projection, what relationship exists between the projectors (projection lines) and the principal planes?

   (a) 45 degrees
   (b) 90 degrees
   (c) parallel
   (d) no relationship

3. Each orthographic view has two dimensions. In the spaces below, list the dimensions (height, width, or depth) contained in each view.

View	Dimensions	
(a) top	_____	_____
(b) front	_____	_____
(c) bottom	_____	_____
(d) rear	_____	_____

4. List the six views possible in orthographic projection.

   (a) _____ (d) _____
   (b) _____ (e) _____
   (c) _____ (f) _____

Unit 8 Orthographic Projection/Multi-View Drawing/Shape Description

Answers to sample test questions.

1. C

2. B

3.

View	Dimensions	
(a) Top	width	depth
(b) front	width	height
(c) bottom	width	depth
(d) rear	width	height

4. Front, top, r-side, L-side rear, bottom

Sample Test Questions Unit 9
(Dimensioning (Size Description)

____ 1. Dimension lines indicate:

(a) axis of symmetry
(b) visible edge of an object
(c) the portion of an object has been cut away

____ 2. Dimensions on an object describe:

(a) shape of the object
(b) indicates scale of the object
(c) that the surface is to be finished
(d) that the surface has been machined

____ 3. Dimension lines should be:

(a) not more that ¼" from the object lines
(b) at least 3/8" from the object lines
(c) at least ½" apart
(d) 1/8" from the object

____ 4. The circle is dimensioned from:

(a) center to center
(b) edge to edge
(c) leader to leader
(d) none of these

T F 5. The dimension must be terminated by a short flanged arrowhead.

T F 6. The two systems of dimensioning are aligned and unidirectional.

T F 7. On circular-end parts, the center to center dimension is generally given instead of an overall dimension.

T F 8. Leaders should never be vertical or horizontal.

T F 9. The height of whole numbers is half the size of fractions.

T F 10. Vertical guide lines are just as important as horizontal guide lines.

Unit 9 Dimensioning (Size Description)

Answers to sample test questions.

1. B
2. B
3. B
4. T
5. F
6. T
7. T
8. T
9. T
10. F

Sample Test Questions for Unit 10
Pictorial Drawing

____ 1. In an isometric drawing of a cone, the three principal planes appear:

(a) equally foreshortened
(b) true size
(c) unequally foreshortened
(d) 30 degrees with each other

____ 2. The angles between isometric axis are:

(a) 30 degrees
(b) 60 degrees
(c) 120 degrees
(d) 150 degrees

____ 3. The four-center ellipse method cannot be used when:

(a) used on an oblique drawing
(b) used on an isometric
(c) used on a perspective
(d) used on the profile plane of an isometric

4. What is the most common type of oblique projection?

5. Are oblique dimensions always in the same plane as the extension lines?

T F 6. Oblique drawing can be projected at any angle other than 90^{o}.

T F 7. Two types of oblique drawings are cavalier and cabinet.

T F 8. The depth axis in oblique drawings are always drawn full size.

Unit 10 Pictorial Drawing

Answers to sample test questions.

1. A
2. C
3. C
4. Cavalier
5. Yes
6. T
7. T
8. F

Sample Test Questions for Unit 11
Sectional Drawings

T F 1. A section is used to show the inside of the object more clearly.

T F 2. A half-section means half of the object is removed.

T F 3. If a view is complicated, it may be necessary to show more than one section.

T F 4. Cutting planes may not be bent or offset.

T F 5. It is permissible for cutting planes to cross each other.

____ 6. When drawing a half section:

(a) half of the view is elevation and half is section
(b) a center line is used to divide the sections
(c) it shows the interior and exterior at the same time
(d) all of the above are true
(e) (a) and (c) are true

____ 7. When dimensioning holes located an equal distance from the center of a piece:

(a) they should be located on a bolt circle
(b) the term "Equally spaced" should not be used
(c) tolerancing is not necessary
(d) coordinate dimensioning should be used

____ 8. Hidden lines may be shown:

(a) on the cut surface because that is the clearest place to show them
(b) on the orthographic views only
(c) on all sections for clarity
(d) on the cut surface only when required for clarity

Unit 11 Sectional Drawings

Answers to sample test questions.

1. T
2. F
3. T
4. F
5. T
6. D
7. A
8. D

Sample Test Questions for Unit 12
Auxiliary Drawings

T F 1. Reference planes are always at right angles between the primary view and auxiliary view.

T F 2. Measurements are always made at right angles to the reference lines, or parallel to the projections lines.

T F 3. Auxiliary views are never classified according to the principal dimensions of the object shown in the auxiliary view.

T F 4. A normal is a projection that has the viewing direction perpendicular to, and made on a plane parallel to the object face.

T F 5. In practice, hidden lines are omitted in auxiliary views.

6. An _____ surface is a surface that is at an angle to two of the principal planes of projection and perpendicular to one principal plane of projection.

7. Two methods commonly used for developing an auxiliary view are the _____ line method and the _____ plane method.

8. A surface that is at an angle to all three of the principal planes of projection is called _____ or _____ surface.

Unit 12 Auxiliary Drawings

Answers to sample test questions.

1. T
2. T
3. F
4. T
5. T
6. Inclined
7. Folding, reference
8. Skew oblique

Sample Test Questions for Unit 13
Thread Representation

_____ 1. Threaded fasteners are used to:

(a) make adjustments and transmit motion
(b) assemble parts and apply pressure
(c) make measurements
(d) all of the above
(e) none of the above

_____ 2. The American National thread system consists of:

(a) national coarse thread
(b) Whitworth thread
(c) national fine thread
(d) answers (a) and (b)
(e) answers (a) and (b)

_____ 3. The outside diameter of a thread may be expressed at:

(a) pitch
(b) root diameter
(c) minor diameter
(d) major diameter
(e) pitch diameter

_____ 4. The number of threads per inch depends on:

(a) the crest
(b) the pitch
(c) the root
(d) all of the above
(e) none of the above

_____ 5. Bolts and nuts are represented as:

(a) unfinished
(b) semi-finished
(c) finished
(d) all of the above
(e) none of the above

_____ 6. Left-hand threads are indicated by the initials:

(a) LHH
(b) LH2
(c) LHT
(d) LHL
(e) LH

Unit 13 Thread Representation

Answers to sample to test questions.

1. D
2. E
3. D
4. D
5. D
6. E

Sample Test Questions for Unit 14
Working Drawings

____ 1. If more than one detail is used in a drawing and details are drawn to different scales, the correct practice is to:

(a) place all scales in title block
(b) show principal detail scale with notation "and noted" in the title block
(c) show the scale only under detail
(d) show the scale of main detail with a notation "and noted" and other scales under each detail

____ 2. Which of the following is <u>not</u> a feature of a detail drawing?

(a) one or more views
(b) auxiliary views
(c) sectional views
(d) installation dimensions

____ 3. A characteristic of a detail assembly drawing is:

(a) it includes both the assembly and construction details of the parts
(b) it minimizes confusion by eliminating hidden lines
(c) a parts list is combined with a materials list
(d) it specifies exactly how a component is to be installed

____ 4. Which of the following is <u>not</u> a feature of a detail drawing?

(a) auxiliary views
(b) sectional views
(c) orthographic drawing
(d) installation dimensions

Unit 14 Working Drawings

Answers to sample test questions.

1. D
2. D
3. A
4. D

BASIC TECHNICAL DRAWING

TOOLS AND EQUIPMENT

Classroom Tools and Equipment Provided by the School include:

Item	Quantity	Description
Drafting Table	25	30" x 42" w/five storage drawers
Drafting stools	25	Steel frame 30"
Blueprint machine	1	60"
Paper cutter	1	36"
Pencil sharpener	1	General purpose
Supply storage cabinet	1	Metal
Drawing storage cabinet	1	Metal
Teacher desk w/chair	1	Wood
Drawing board	25	18" x 24" wood/metal edge
Drawing paper	200 sheets	8½ x 11" tracing
Drawing paper	200 sheets	11" x 17" white
Drawing paper	100 sheets	18" x 24" tracing

The following is a list of tools and equipment to be furnished by the student enrolled in a basic technical drafting course:

Item	Quantity	Description
Set of drawing instruments	1	General purpose
T-square	1	24" plastic
Triangle	1	45° - 10" clear
Triangle	1	30° x 60" - 8" clear
Scale	1	Architect plastic
Dust brush	1	8" horsehair
Erasing shield	1	Metal
Ames Lettering Guide	1	Clear plastic
Protractor	1	General purpose, clear plastic
Irregular	1	8" clear plastic

The following is a list of consumable supplies to be furnished by the student enrolled in a basic technical drafting course.

Item	Quantity	Description
Drafting tape	1 roll	3/4" 60 yards
Eraser	1	Plastic
Eraser	1	Art gum
Sandpaper pad	1	
Dusting powder	1	12 oz. bottle
Pentel	1	.05 MM
Leads	2 ea.	4H, 2H, HB
Illustration Board	1	18" x 24" white

RESOURCES

The following list of Resource Materials is by no means complete or exhaustive. The list merely represents a compilation of relevant and readily-available resources frequently used by drafting teachers.

1. Basic Drafting. State of Louisiana: Vocational Curriculum Development and Research Center, 1979.

2. Brown, Walter C. Drafting. Chicago, Illinois: The Goodheart-Wilcox Company, Inc., 1961.

3. French, Thomas E. and Svensen, Carl. Mechanical Drawing. 8th Edition. New York: McGraw-Hill Book Company, 1968.

4. Morrisen, Thomas J. Communication: Drafting. New Jersey: Prentice-Hall Book Company, 1976.

5. Spencer, Henry C. Basic Technical Drawing. New York: The MacMillan Company, 1962.